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P. L. Kingsbury

688 Vermont St.

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A PLEA
FOR THE
CURE OF RUPTURE;

OR,

THE PATHOLOGY OF THE SUBCUTANEOUS
OPERATION BY INJECTION FOR
THE CURE OF HERNIA.

BY

JOSEPH H. WARREN, A.M., M.D.,

MEMBER OF THE BRITISH MEDICAL ASSOCIATION, MEMBER OF THE AMERICAN
MEDICAL ASSOCIATION (JUDICIARY COUNCIL), HONORARY MEMBER OF
THE VERMONT STATE MEDICAL SOCIETY, MEMBER OF THE
MASSACHUSETTS MEDICAL SOCIETY, FORMERLY
SURGEON AND MEDICAL DIRECTOR IN
THE UNITED STATES ARMY.

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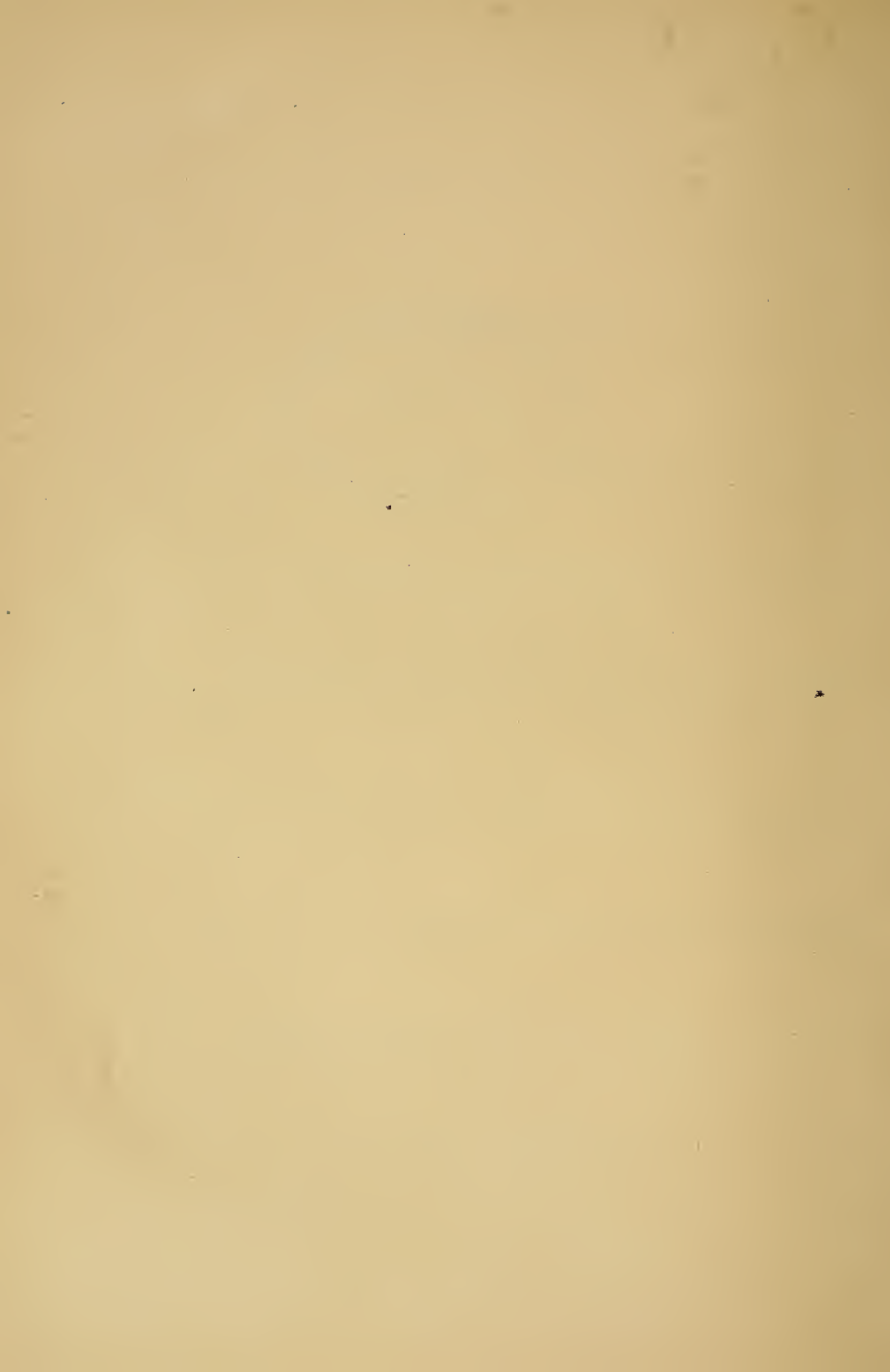
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PREFACE.

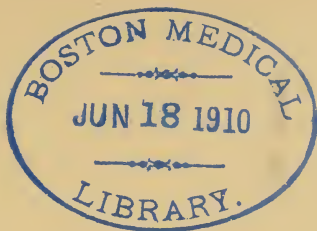
THE new conformateur for measuring and showing accurately the contour of hernia, and deformities, such as fractured bones, tumors, etc., as well as the paper on causation of hernia, were contributed to this monograph by C. Everett Warren, A.B., M.D., of Boston. The paper on the proper fitting and wearing of a truss was contributed by W. Everett Smith, A.B., M.D., of Framingham, Mass. Besides, these contributions I have received cheerful co-operation from both of these gentlemen in preparing this work. I am greatly indebted to George Tiemann & Co. and John Reynders & Co. of New York for illustrations of my instruments; also to Mr. Richard H. Kimball, chemist, of Cambridge, Mass., for his careful and accurate description of the method of preparing the various formulas used in my operations. The paper, "A Plea for Operative Measures for the Relief and Cure of Hernia," which was prepared for reading before the meeting at Liverpool of the British Medical Association, is here published, with very slight alterations, as it originally appeared in the Association's journal.

The portion of this monograph that treats of tissue repair was prepared for presentation before the Suffolk District Medical Society some two years ago, but was not read, owing to sickness. Some of my personal friends urged me to publish the article, as it contained matter of interest and value, hitherto unknown, concerning the operation for the cure of hernia by the method of subcutaneous injection. It is here reprinted from the Glasgow "Medical Journal" of April and May, 1883, together with a brief *résumé* of the *modus operandi* of the subcutaneous method, intended to assist those who have not become familiar with the operation as it is presented in my "Treatise on Hernia," second edition, published by James R. Osgood & Co., Boston, Mass., U.S.A., and Messrs. J. & A. Churchill, London.

To this I have added a paper given by me before the American Medical Association in June, 1883, and other matter of interest to the profession.

JOS. H. WARREN.

51 UNION PARK, BOSTON, MASS.



A PLEA FOR THE CURE OF RUPTURE;

OR,

THE PATHOLOGY OF THE SUBCUTANEOUS OPERATION
BY INJECTION FOR THE CURE OF HERNIA.

PART I.

INFLAMMATION AND ITS RELATION TO TISSUE REPAIR.

"The subject of irritation being the foundation of surgical science, you must carefully study and clearly understand it before you can expect to know the principles of your profession, or be qualified to practise it creditably to yourselves or with advantage to those who may place themselves under your care." — SIR ASTLEY COOPER, *Lectures on Surgery*.

Theories of Inflammation. — "No topic in medicine has been the subject of so much research and speculation as the nature of inflammation; but even at the present time it is impossible to give a complete and correct definition of inflammation from a pathological or an etiological stand-point" (Flint). The word originated when there were no true pathological ideas; yet even the oldest observers

regarded the process as an intense increase of the normal physiological processes, — a “disturbance of nutrition” (Virchow). The idea, however, that the classic symptoms, *tumor, rubor, calor, dolor*, — pain, heat, redness, and swelling, — are the true characteristics of inflammation, has unfortunately become so deeply rooted that it may seem to some almost absurd to claim that the inflammatory processes may be present in tissues even when the local *gross* symptoms are absent. The modern histological idea of inflammation as a purely *regenerative* process, which directly or indirectly replaces the loss of substance, cannot, indeed, be rigidly separated from the classical idea of an intense irritation which tends directly or indirectly to a *destructive* process. The difference is only in the *degree* of irritation; but this is a difference so fundamental and important for the proper understanding of the processes of tissue repair, that it must be made emphatic. The word “inflammation” is, however, in such common use, that it would be foolish to attempt to discard it. I shall therefore, for the clearness of discussion, designate the *salutary* process REGENERATIVE INFLAMMATION, and reserve for the *intense* process the term CLASSIC INFLAMMATION.

According to John Hunter, and to the modern French surgeons, the essential phenomena are referable to the vascular system. Plastic lymph — that is, a thin opalescent layer containing fibrin and red and white blood-corpuscles — is derived from the vessels by exudation, and is susceptible of organization, and of the formation of the different tissues of the body. Recently this theory has been revived in a modified form by Cohnheim, who explains the process by an exudation of serum and white corpuscles, and a coagulation of a fibrinogenous substance contained in the exuded serum.

Plastic-Lymph Theory. — The former ideas of this effused lymph divided it into two distinct classes, which have received various names: —

Healthy (Clarke).	Unhealthy.
Plastic (Williams).	Aplastic.
Fibrinous (Paget).	Corpuscular.
Fibrinous (Rokitansky).	Croupous.
Coagulable.	Degenerative.
Adhesive.	Suppurative.

According to this theory, which held undisputed sway for many years, and which is even at the present day often confounded with later and more exact theories, there are two elements in the exu-

dation — namely, fibrin and corpuscles — which control the development of this lymph, so called. In proportion as fibrin is abundant, so will the tendency to organization and adhesive inflammation prevail; but, in proportion as the blood-corpuscles are abundant, so will the tendency to degeneration and suppurative inflammation prevail. Ever since the time of Bichat, there has been a general impression that each tissue has its proper mode and product of inflammation, *serous membranes being prone to fibrinous exudations, mucous to suppurative or corpuscular, and cellular to both fibrinous and corpuscular*. Slight inflammations also were believed to be almost always corpuscular, while the more acute and active were fibrinous.

Repair by means of *nucleated cells* was said to be observed in granulations, in inflammatory adhesions (either in *serous sacs* or in healing by first intention), in inflammatory indurations, and in certain naturally developed connective tissues. The process was actually described by Schwann, who saw the nuclei become more distinct, and then have several nucleoli appear in them. The cells, moreover, became granular and elongated, and grouped together in clusters or filaments.

Development of *fibrous* tissue was supposed to take place by means of a *blastema*, and was best seen in subcutaneous wounds.¹ It was the only mode of formation of connective tissue recognized by Henle.² A similar process is described by Reichert, Zwicky, and Gerlach. The first thing noticed after the exudation was a quantity of molecular or finely shaded substance like homogeneous or dotted fibrin. At first there were no nuclei or cells apparent; but later they began to appear as oval bodies, soon becoming elongated. They had clear contents and no nucleoli, and were very firmly embedded in the blastema. These nuclei underwent very little change, except to elongate, and possibly to become irregular in outline; but the blastema assumed a more and more filamentous appearance, and finally a filamentous structure. Henle, indeed, supposed the nuclei to be made into fibres; but of this there does not seem to be proof. The exudation of cells which, of course, to a limited extent accompanied this blastema, was considered to have no share in the healing process. In fact, the more abundant the cell-exudation, the longer the inflammation; and the longer the inflammation, the less speedy and perfect was the

¹ Paget: Surgical Pathology.

² Allgemeine Anatomie.

repair. The theory of a blastema is now, however, antiquated, and believed to be histologically incorrect.

Proliferation Theory. — Virchow, on the contrary, rejecting Hunter's doctrine, maintained that the chief effect of an inflammation is an increased function and nutritive activity of cells in the solid tissues outside the blood-vessels, and that hyperæmia and exudations from the blood are secondary changes. This theory rests on a *proliferation* from pre-existing fixed cells, in accordance with the law, "*Omnis cellula e cellula*," and is to-day supported by Stricker, Burdon Sanderson, and their school.

Cohnheim's Theory. — The discovery by Recklinghausen, in 1863, of wandering cells in the tissues, rendered Virchow's theory¹ somewhat doubtful, while a new era was introduced in the history of inflammation by Cohnheim's discovery² of the emigration of white blood-corpuscles. This migration of cells had been first observed by Dr. W. Addison,³ and again by Dr. A. Waller;⁴ but their isolated observations were little thought of, and soon forgot-

¹ Über Eiter und Bindegewebskörperchen. — *Virch. Archiv.*, xxviii.

² Über Entzündung und Eiterung. — *Virch. Archiv.*, xl., 1866.

³ Experimental and Practical Researches on Inflammation. — *Trans. Prov. Med. Assoc.*, 1842.

⁴ Phil. Magazine, vol. xxxix., 1846.

ten. This is not the place to detail the theory of Cohnheim, which is already accepted as scientifically accurate, nor to discuss the exact method of the emigration of these cells. The former is too well known to need description; the latter is still a question of some dispute.

That the greater number of these cells is undoubtedly the result of an emigration of these white blood-corpuscles is, however, by no means incompatible with the theory that the fixed cells of connective tissue become amœboid, proliferate, and produce other cells; that is, take part in the regenerative process.

Organization. — The nature of this cell activity is conservative. Whenever a living tissue is irritated, provided the irritation be insufficient to destroy the vitality of the part, an inflammatory process is set up which tends to recovery, and is indeed the one process indispensable and necessary for recovery. These cells, which have been produced by a process of emigration, or of proliferation, or by both processes combined, do not, however, remain stationary and inactive. They tend to become either *organized* into higher structures, or *disorganized* into a state of fatty degeneration and

absorption, or else a state of *suppuration*. The tendency to undergo a progressive organization into higher tissues will vary : —

1. With the tissue involved.
2. The condition of the individual.
3. The degree of inflammation.

In non-vascular tissues, such as cartilage, tendon, and the cornea, exudation from the neighboring vessels is limited, and hence the effusion is small in amount ; while in vascular areas, as bone and the loose connective tissues, the inflammatory effusion is more abundant. “ The more intense, however, the inflammation, the more abortive are the young cells, and the less their tendency to form a permanent tissue ” (Green).

Resolution. — On the other hand, if the injury to the tissues be very slight, the inflammation may gradually subside, the emigration cease, the young cells become fatty degenerated, and little by little pass into the lymphatic circulation, and leave the tissue in its normal condition.

Suppuration. — If, however, the irritation be so severe or prolonged as to prevent either resolution or organization, or if the condition of the individual be unfit to produce a favorable termination of tissue

lesions, the cells will accumulate in such numbers and so degenerate as to become purulent in their nature and behavior. In regard to the influence of constitutional peculiarities over the tissue changes in inflammation, clinical evidence is not wanting. The taint of various diatheses, the scrofulous so called, the syphilitic, cancerous, and tuberculous are well known to impart an abnormal susceptibility of certain tissues to injury or irritation, and a peculiarity in the products and course of the inflammation which such irritation produces. There is little or no tendency to the organization of healthy new growth. From facts such as these the conclusions have been drawn, that in young persons, and in persons of strong constitution, we may, as a rule, look for a good and permanent repair of tissue lesions, a so-called "*adhesive inflammation*," but that in the old and cachectic we may expect a *suppuration*.

The deleterious influence which pus exercises upon surrounding tissues and the process of repair is also a well-known clinical fact. Pus, which has remained for any length of time in the tissues, undergoes certain changes. It may undergo fatty metamorphosis, and thus, by absorption, poison the system. At any rate "the pus-corpuscles appear

to be endowed with the power of absorbing the tissues with which they come in contact, or at all events of causing their liquefaction:" hence the softening and disintegration of the tissues which constitute such a destructive element in intense inflammation.

Subcutaneous Healing. — The problem of modern surgery has been to create a sufficient amount of inflammation to produce the amount of exudation requisite to insure tissue organization, but not to exceed this sufficient amount of exudation, and so produce an *intense* inflammation with all its purulent sequelæ. This problem has been solved by the introduction by Strohmeier and Dieffenbach of the method of subcutaneous operations. In fact, the fundamental and only essential principle of Listerism is the exclusion of outside foreign material; that is, the transformation of an open wound into a wound practically subcutaneous.

The advantage of a subcutaneous over an open wound is this: the former heals by *primary adhesion*, — the "First Intention" of Hunter, — other conditions of the patient being favorable; while the latter, under the same conditions, might heal by primary, but would probably heal by *secondary ad-*

hesion, — the “Second Intention” of Hunter; that is, by granulation and suppuration.

What, then, are the processes we observe in union by primary adhesion after a subcutaneous operation? As a result of the operation the conditions of the vascular circulation have been altered. The liquor sanguinis which has thus escaped coagulates within twenty-four hours, on account of the fibrin elements it contains, and imprisons numbers of white corpuscles. The stiffening of this intercellular substance explains why the union is so firm as to unite without sutures. The cells in the wound gradually become spindle-shaped, and assume more and more the form of normal fibrous connective tissue, becoming stellate and anastomosing into a firm network.¹ However rapid the union may be, it is not so simple as some authors have thought.²

Formerly, under the old plasma theory, as I have previously said, it was supposed that the fibrin which was exuded in the liquor sanguinis was changed directly into fibrous tissue. Schwann assumed that there existed originally spindle cells

¹ Kolliker describes the white fibrous tissue as formed from the coalescence of fusiform cells, and the yellow elastic fibres as developed from the stellate branching corpuscles, which Virchow has called connective-tissue corpuscles.

² Cornil and Ranvier: *Path. Histology*, p. 71.

from which bundles of connective tissue were developed by a splitting of the body of the cell. Henle thought that originally there were no cells, but only nuclei, and that the fibres which afterward appeared were produced by direct fibrillation of the blastema, while the nuclei gradually became elongated, and coalesced to form longitudinal fibres (*Kernfasern*,—nucleus fibres). Reichert contended that there were both cells and intercellular substance, but said, “The intercellular substance fibres were a false interpretation of an optical image.” Virchow, with Schwann, and against Henle, believes that spindle-shaped cells indisputably exist, and with Henle and Reichert, and against Schwann, that a splitting-up of the cells into fibres does not occur, but that a previously homogeneous or mucous intercellular substance becomes fibrillated in some way, while the young cells maintain their integrity throughout. It is unnecessary to say that this is a manifest inconsistency in Virchow’s “Cellular Pathology.”

Max Schultze of Germany, Beal of England, and Leidy and Tyson of America believe that the intercellular substance originates by a change in the nucleus at its periphery, and by a pushing-off

of this formed material from the cell. This theory seems to be the most consistent with observation, and is the one that is generally adopted at the present day.¹

The intercellular substance having thus been formed has yet to undergo other processes before it reaches a stable state. The spindle cells assume the flat shape of connective-tissue corpuscles, and coalescing into bundles or fasciculi, with the nuclei alone remaining, gradually render the newly formed tissue firmer and denser by the contractile power of fibrous tissue, until at last it is as solid and compact as normal tissue, and remains stable in this state. That this contraction and stability of the new fibrous tissues is not merely theoretical, but is emphatically proved by clinical experience, will be later clearly shown.

Healing by Granulation or Suppuration. — All wounds do not, however, heal by primary adhesion, and especially is this statement true of wounds where open incisions are made through the cutaneous tissues to the deeper parts. The process of repair in such wounds is rarely other than by *secondary adhesion* or by *suppuration*. Histologically the process is the same in character as in

¹ Tyson: The Cell Doctrine, p. 141.

repair by primary adhesion ; but it differs greatly in degree. The cicatrization also is slower, and the tissue may experience the divers accidents incident to suppurating wounds. When, however, inflammation is artificially produced in order to gain a regenerative new formation, this difference becomes so important as to throw the two processes of healing into distinct classes, — one of which, the primary adhesion, attains the end for which it is seeking ; the other, the secondary adhesion, tends to defeat it. Whereas in the subcutaneous operation we had no external opening, in this case we have an open, gaping wound. The flaps are reddened, swollen, and sensitive to the touch, while over their whole extent is seen a number of yellowish or grayish particles. These particles are dead bits of tissue still adherent to the living portion. Particularly is this the case, says Billroth,¹ if tendons, or fasciæ, or the cortical substances of bones have been injured, and if the wound is upon old or debilitated persons or badly nourished children. Under such circumstances as these, the process of repair will be much prolonged. Until, then, these irritating bits of dead tissue “ clean

¹ General Surgical Pathology and Therapeutics. Amer. Ed. Sec. vii., p. 7.

off," no active process of repair can begin. Supposing repair to have begun, we shall find the wound gradually filling up from the bottom with a mass of cells or granulation tissue. These granulations are covered all the time, however, with a fluid which becomes thick, pure yellow, and of creamy consistence.

This is pus, and in this lies the danger and the weakness of the granulation process. In most cases more or less of this pus will die from insufficient blood-supply. The cells escaping from the vessels remain upon the surface of the tender granulations, bathing them in a soft gelatinous fluid. This fluid tends to disintegration and re-absorption into the body through numerous lymph channels, and at the same time re-acts upon the newly formed granulations beneath it. Some of the cells gradually become fatty and granular, and are absorbed, while others undergo the change into connective tissue already described. At best the process is a long and tedious one compared with subcutaneous processes; and the danger is always an immediate one, that in place of organization a suppuration may destroy what little has been built up.

Laws governing Repair. — From all that has been said, *six* important laws controlling the transformation of the inflamed tissue may be legitimately deduced : —

1. A certain amount of inflammation is necessary for repair.

2. Inflammation and repair, although bearing the relation of cause and effect, are antagonistic in their processes. In other words, repair does not, and cannot, begin until inflammation subsides ; and the longer and the more severe the inflammation, the more weakened will be the tissues, and the less able will they be to organize into higher development.

It is true John Hunter claimed that “injuries in which the parts do not communicate externally seldom inflame, while those which have an external communication commonly both inflame and suppurate.” Nor is it inconsistent in the least with what I have just laid down as a general axiom : on the contrary, it rather corroborates it. Viewed with the naked eye the gross appearances of a subcutaneous wound are those of a total absence of inflammation ; but the process that is going on beneath the surface, and at the seat of irritation,

is essentially and histologically inflammatory. If, however, this inflammation becomes more intense than nature requires for the healing process, it passes beyond a mere physiological activity of cells, and reveals itself by the classical signs of inflammation, — *Rubor et tumor, cum calore et dolore*.

3. "The processes of repair are identical in all tissues, such modifications alone showing themselves as necessarily appertain to the anatomy of the tissue, or the special circumstance of its position."¹

4. The essential element of repair is the growth of embryonic tissue.

5. "Whenever artificial or pathological irritation has determined a growth of embryonic elements, if the irritation cease, this new growth always tends to return to the original form of the tissue, which served as a matrix."²

6. In other words, "whatever may be the origin of this embryonic tissue, it has a tendency to reproduce the tissue of the region where it is seated."³

¹ Bryant: System of Surgery.

² Cornil and Ranvier, p. 72.

³ Ibid.

PART II.

PERMANENT CURE OF HERNIA BY SUBCUTANEOUS INJECTION.

Tendinous Irritation. — It is strange that, in view of all the logical and scientific thinking of the present day, so many erroneous ideas should be perpetuated in regard to the permanent cure of hernia. Professor Gross, years ago, struck the key-note of the subject when he said that the only chance of curing this complaint lay in compression by a truss, or the inflammation produced by the subcutaneous injection of some fluid. Yet how little is the pathology of such an operation understood, even at the present moment, by the great majority of medical men!

Dr. Heaton¹ ascribed his cures to a method of “*tendinous irritation*” without inflammation, attempting thereby to develop a pathology whose chief

¹ Heaton On Rupture, edited by Davenport.

element is the total absence of all pathology; and on this account some operators have expected a miraculous cure to take place, but, finding that the same laws govern this operation as govern all other surgical operations, have pretended to feel themselves lucky if they got any favorable result whatever from their labors. My object in this paper is to show that the operation has no peculiar pathology in it, that modern pathology corroborates at every step the teachings of clinical experience in the operation, and that those who still persist in assigning the cures by subcutaneous injection to some peculiar "tendinous irritation" without inflammation, are forgetful of their scientific training, and regardless of their reputation for professional consistency.

This "tendinous irritation," so called, is an absolute myth. In reality we have a regenerative inflammation, the pathology of which I have already clearly described. Because the operation is so completely subcutaneous, this regenerative inflammation does not run on into the classic inflammation, as I have called it, nor develop granulation tissue. This is the only *rational method* of closing the hernial canal. On the other hand, all other

operations for hernia fail in good results, because the intense inflammation which they inevitably tend to excite destroys their good intentions.

Wood's operation — about which, of late years, we have heard so much — has in it, indeed, *two* elements of failure. First, it seeks to draw together fibrous bands which are hard, firm, and immovable. This operation in itself excites theoretically very little local inflammation, and therefore there is no obvious reason that I can see why adhesion between these bands, so as to close the hernial canal, ever should take place. It is like operating for a lacerated cervix, or hare-lip, without paring the gaping edges. On this account I suggested to Dr. Henry O. Marcy of Boston, U.S.A., the feasibility of freshening the fibrous edges of the hernial opening before occluding the canal by carbolized ligatures. This method, I understand, he has attempted; and I should think it offers a more rational chance of success than previous treatments by ligature.

The second objection to Wood's operation is, that, when performed in the ordinary manner by wire sutures, it depends for its cure upon a process of granulation which, from its protracted duration,

is fatal to a cure of hernia, and, from its danger of producing an iliac abscess or a general pyæmia, may be fatal to the individual. When, however, operations which involve external incisions are performed under strictly antiseptic precautions, which reduce them theoretically to subcutaneous operations, the results are far more favorable than when the wounds are allowed to heal in the ordinary manner. This fact I have amply shown in my description of Czerny's method of operation in my "Practical Treatise on Hernia."¹

Closure of the Sac.—The statement has been made that "the essence of success in hernial operations consists in setting up peritonitis in the sac, and in the ability to control the inflammation when started."² This, of course, can apply only to cases of congenital hernia, and even in these cases is true only in a very modified manner. The essential element of success in the cure of congenital hernia, as in the cure of acquired hernia, is the *closure of the hernial rings and hernial canal*. It is true that such closure will at the same time obliterate

¹ Treatise on Hernia. Second edition. Boston: J. R. Osgood & Co., 1882.

² Dr. D. W. Cheever in Boston Med. and Surg. Jour., 12th Jan., 1882.

ate the unclosed pouch of peritoneum ; but, if this pouch be the only thing that is occluded, there is nothing to prevent another protrusion of the peritoneum through the canal, which is still unclosed, forming what is termed the “acquired congenital form of hernia,” “the encysted hernia of Sir Astley Cooper,” or the “infantile hernia of Hey.”¹ But, even supposing that a limited degree of local peritonitis is the result of our treatment, we do not fear the result. On the contrary, we are rather rejoiced that it should occur, since it tends to complete the cure by causing adhesion between the visceral layers of the sac, and also between the parietal layer and the fasciæ forming the hernial canal. The time has been when local peritonitis was the bugbear of abdominal surgery ; but that has long ago passed away, as the many successful abdominal sections and ovariectomies bear witness. Certainly, as bold an operation as any subcutaneous injection was recently reported² from Dr. H. J. Bigelow’s practice, where, for an umbilical hernia, the invaginated sac of the integument was blistered successively with tincture of cantharides, liquor

¹ Practical Treatise on Hernia, p. 16.

² Boston Med. and Surg. Jour., 5th Jan., 1882.

ammonia fortior, and tincture of iodine, to produce intense suppuration in hope of a permanent cure. One hundred and sixteen days after entrance to the hospital, granulations were seen at the neck of the inverted sac; two hundred and two days after entrance, the patient was allowed to sit up for a short time; and two hundred and fourteen days after entrance, she was dismissed cured, but told to wear a truss as a matter of precaution. If the obliteration of such an organic plug as this invaginated hernial sac would not tend to produce local peritonitis, I fail to understand what would.

It has been claimed that this method of procedure involved rather a new process of curing hernia. As long ago as the times of Ravin, Rivière, and Arnauld, *position* was recommended as a cure, while the process of inflaming a fold of invaginated skin is the very method which Gerdy and Signoroni practised in 1837, and which Würtzer modified.

Injection of the Sac. — A second error in regard to the subcutaneous method of injection is one that I have time and again emphatically contradicted. The profession will persist in supposing that the injection is to be made into the hernial sac, — that

is, into the peritoneal cavity, — and consequently expect to see a general peritonitis, and perhaps an inflammation of the cord and testis, sympathetic or traumatic. This is the method described in most of the text-books of surgery; but certainly a cure by such a process would be little short of a miracle. If this were the correct theory, we might as well expect that a sieve would hold water as that a peritoneum would support the pressure of the intestines, constantly forced down by gravity and the contraction of the abdominal muscles into a perfectly open hernial canal. I say it once for all, the tissues to be irritated and organized into fibrous structure are the tendons and fasciæ forming and comprising both the internal and external hernial rings, together with the whole length of the hernial canal, and that the hernial sac is always to be thoroughly reduced before the operation whenever it is possible. If, perchance, the sac has become adherent to these rings or the canal, we can by a very little manipulation, such as most surgeons are capable of, lodge the point of the syringe between the sac and the borders of the canal, and deliver our injection *into* the fibrous tissue and *around* the hernial sac. As I have

already said, a little inflammation of such a sac is not only not to be dreaded, but, on the contrary, rather to be desired.

Action of Quercus Alba. — A third error, and the last that I shall notice here, has reference to the astringent properties of the quercus alba, which is injected. None of the fluids employed by the early operators in subcutaneous injections for hernia were used with any idea that it was a fibrous *contraction* that was to be sought. On the contrary, the very first idea of this method was suggested to Velpeau by the injection method of curing hydrocele, which was by creating *inflammation* and *adhesion*. Never, before Heaton, had any one ever dreamed that it was to “the astringent principles of the injection,” producing “a permanent contraction of the fibrous structures,” that we must look for our regenerative process, and never again may we hear of such pathology. I am not surprised when I think of this, that surgeons have been sceptical of the benefits resulting from the injection method; but I am surprised when I hear medical men of the present day repeating and believing such false pathology.

The operation for the cure of hernia by subcuta-

neous injection is then successful, *not* because it produces a “tendinous irritation,” — that is, an immediate contraction of fibrous tissues, — but *because it produces a local inflammation without suppuration*. This is an important distinction, both as regards the theory and as regards the practical success and permanence of the operation. All other methods have accepted and expected suppuration as an accompaniment of the operative procedure, and have not been disappointed when they obtained it. This method avoids suppuration, as it would every other unfavorable complication. Other methods cannot avoid suppuration: this method can, and does avoid it when properly performed, and with the proper fluids.¹

As regards the comparative value of the fluids that have been used from time to time for injection, it is altogether probable that many have failed because they were absorbed without producing the amount of inflammation necessary to produce a reorganization of fibrous tissue. Probably oak-bark is

¹ With the fluid which I have latterly adopted and used in upwards of a hundred cases, I have not had a single case of suppuration. Among my first few cases, in which I used Heaton's mixture and instruments, I had three cases of suppuration, — one severe and two slight cases.

specific in its action, because, of all substances not destructive to the tissues, it refuses most obstinately to be absorbed before the inflammation set up by it, the ether and alcohol, shall have caused a sufficient cellular activity to render the regeneration of the normal fibrous tissue reasonably certain. All that by any possibility its astringent properties can do is to aid, perhaps, in keeping the fibrous pillars of the hernial rings somewhat in their normal position until the new tissue is properly organized into a firm growth.

Is this New Fibrous Tissue Stable? — Thus far we have considered the cure of hernia from the theoretical stand-point of the nature of the inflammatory process. What evidence can be adduced that the new fibrous tissue, which is formed by this regenerative inflammation, will be permanent, and not readily absorbed? The proof that can be offered upon this question is very positive and twofold in its nature, — first, the evidence drawn from analogy; second, the unmistakable evidence of clinical experience.

Proof by Analogy. — By the evidence afforded by analogy I mean the history of the permanence of fibrous new growths and adhesions produced by

inflammation in other organs and tissues of the body, besides the hernial rings. In examining these fibrous tissues I shall use for my chief reference the latest and most authoritative work on pathological histology. I refer to Cornil and Ranvier.

Let us first consider *arteries*¹ and *veins*.² Certainly, every surgeon has abundant opportunity to see the inflammatory processes that occur in these tissues by the re-organization which takes place in vessels that have been ligatured. The whole safety of the recovery depends upon the knowledge that the new tissue here formed will not become absorbed, but will endure as long as the arteries endure. Not only, however, is the growth of permanent tissue seen in traumatic inflammation, it is seen also in acute *endarteritis* and in *periarteritis*, occluding the vessels, and hindering or even arresting the circulation of the blood. The same permanent new tissue is seen also in chronic *endocarditis*³ and in *valvulitis*,⁴ in which latter process the chordæ tendiniæ of the auriculo-ventricular valves are also indurated and shortened. When, however, a sup-

¹ Cornil and Ranvier, p. 307.

² Ibid., p. 339.

³ Ibid., p. 300.

⁴ Ibid., p. 303.

puration occurs in or around these structures, the process is well known to be destructive and absorptive.

Inflammatory new growth of tissue, which is remarkably permanent and firm, is seen also in chronic *mastitis*,¹ chronic *adenitis*,² chronic *bronchitis*,³ *oesophagitis*⁴ (where the resulting stenosis is often extreme), in cicatrization of *ulcers of the stomach*,⁵ producing the hour-glass constriction, and in cicatrization of *intestinal ulcers*, whether tubercular, syphilitic, typhoid, or dysenteric. The result of such fibrous cicatrization is "obstinate constipation, and even complete obstruction of bowels."⁶ In *cirrhosis of the liver*,⁷ and in *fibroid phthisis*, so called,⁸ the same inflammatory fibrous growth, from its remarkable persistence, calls forth the gravest prognosis. In the fibrous form of *interstitial nephritis*,⁹ the characteristic and *incurable* lesion is the formation of new connective tissue, embryonic or fibrous, and atrophy of the secreting glands. Not

¹ Cornil and Ranvier, p. 707. ² Ibid., p. 353. ³ Ibid., p. 405.

⁴ Ibid., p. 459. ⁵ Ibid., p. 471.

⁶ J. J. Woodward in Med. and Surg. Hist. of War of Rebellion. Med. Vol., Part ii., vol. ii., p. 503.

⁷ Flint: Principles and Practice of Med. 3d Ed., p. 607.

⁸ Ibid., p. 223.

⁹ Cornil and Ranvier, p. 631.

infrequently as the result of a simple *orchitis*¹ do indurations, consisting of hard and contracting cicatricial tissue, compress the excretory ducts of the testicle, causing a narrowing or entire obliteration of them, and consequently a suppression of the functions and an atrophy of the testicle.

The time has been when *inflammation of the urethra* producing stricture was considered a special type ; but now I think it is agreed that the type is common to all fibrous tissues, since stricture may occur not only as the result of gonorrhœa, but also before puberty, and as the result of a traumatic injury. The locality of a stricture is important in relation to its pathology. By far the majority of cases occur at the junction of the spongy and membranous portions of the urethra, where the surrounding connective tissue is loose and comparatively superficial. As, however, we approach the prostatic end of the membranous portion, where the connective tissue is dense and firm and deeply seated, stricture becomes rare in occurrence. The rule seems to be that stricture occurs most readily where the opportunity for the deposit and organization of inflammatory material is the greatest.

¹ Cornil and Ranvier, p. 660.

This is precisely the pathology we have presented in regard to the permanent cure of hernia by subcutaneous injection.

The results of *inflammation of serous membranes*¹ are well known to every physician who has ever made or seen an autopsy. Few indeed are the subjects who do not present adhesions of the pleuræ, either band-like or even obliterating the pleural cavity. Sometimes these bands are seen in the pericardial sac,² while after the various forms of abdominal inflammation cases are by no means rare where the whole length of the intestines, with all the abdominal organs, has been fused into one solid mass by firm and persistent adhesions. More common indeed are the firm local adhesions resulting from chronic *ovaritis*, *salpingitis*, and *perimetritis*.

In *arthritis*,³ whether acute or chronic, traumatic or rheumatic, the synovial membrane is not the only part affected; but even in slight attacks a modification of the diarthrodial cartilage is constantly seen. The histological process is very readily appreciated by the microscope, while many a sufferer can testify that the thickening and stiffening of rheumatic joints is one of the most obstinate

¹ Cornil and Ranvier, p. 259. ² Ibid., p. 290. ³ Ibid., p. 228.

of tissue lesions to overcome. On the other hand, in those forms of arthritis which go on to an intense inflammation and even suppuration, what lesions do we find? An erosion and ulceration of tissues, a caries of bone, and finally a complete destruction and absorption of all surrounding parts.

In myositis, as seen after wounds, the new formation is firm and fibrous in its nature, forming, as Billroth expresses it, an "*inscriptio tendinea*." In his opinion the process never goes beyond the formation of tendinous tissue; but Weber and Gussenbauer maintain that a growth of muscular tissue gradually develops. At any rate the healing process is complete, unless the inflammation has been so severe as to be suppurative. In such cases the muscular fasciculi undergo fatty degeneration, and ultimately die. In this connection I would mention the comparatively rare condition known as fibroid induration of the heart.¹ This, in most cases, is a result of myocarditis, and is produced by inflammation of the peri- or endocardium, or in some cases by syphilis. It consists of the development of a fibrillated tissue between the muscular fasciculi, which is so pro-

¹ Green's Pathology, 3d Amer. Ed., p. 230.

gressive in its growth that it causes atrophy and fatty degeneration of the muscles, and is one of the gravest of cardiac diseases.

Finally, let us consider inflammations of the skin. No lesion which does not destroy the papillary layer produces a scar, or cicatrix.¹ When the papillary layer has been destroyed by ulceration, deep burns, scalds, or wounds, a firm contracting cicatrix is formed, "permanent, continuing to exist through life with but little alteration."² The fearful contortions produced by the contraction of scars from burns and scalds are an every-day occurrence, and require the utmost skill of the patient surgeon to overcome or even relieve. The same contortions are seen in injuries of deeper parts, as muscles, fasciæ, and tendons. It is true these are all formed by a process of suppuration; but the contraction is well marked, *because* there is no strain put upon the tissues to force them apart continually, as there is in the curing of a hernia. Indeed, treatment by mechanical extension is one of the best methods of overcoming the deformity caused by a burn.³ On the other

¹ Cornil and Ranvier, p. 734.

² Duhring: Diseases of the Skin, p. 54.

³ Bryant, Billroth.

hand, it is a well-known fact that scars tend very gradually to become somewhat softened and obliterated, and, in accordance with the law I have deduced, that repair processes tend to reproduce the tissue of the region where they are seated; that is, tend as regards the skin to develop gradually rudimentary papillæ and epidermis.

Since regenerated fibrous tissue tends strongly to contract, why is it that the operation of tenotomy relieves so much distortion and produces such good results? Simply because the tendinous cicatrix, *before* it has fully organized, is more readily stretched than the original tendon of the muscle. "Tenotomy proves useful only from the orthopædic after-treatment." When, therefore, suppuration unfortunately intervenes, the apparatus cannot be applied until the cicatrix is more firmly organized; and, as a consequence, the benefit of the operation is far less. The same principle is true in the operation for strabismus. The muscle opposite to the one that has been divided rotates the eye so that the severe muscle shall gain a new attachment farther back. Therefore "it is better that the eyes should be moved about while re-union of the muscle is taking place, and especially that they

should be turned in the opposite direction from that of the former squint:”¹ otherwise their condition may be as bad as before the operation.

My objects in thus discussing the various connective tissues of the body have been these:—

1. To demonstrate that all fibrous tissues of the body tend, when inflamed, not only to contraction, but to a permanence of contraction.

2. That it requires the greatest patience, together with considerable mechanical skill, to overcome such permanent contractions when they have become fully organized.

3. That while the inflammatory processes are in the course of organization, and have not developed into firm and stable normal tissue, they may, by the intervention of other processes, tend either to resolution or to suppuration; both events resulting in destruction and absorption of inflammatory new growth either from a slow and imperfect healing, or from the antagonism of natural mechanical forces at work.

4. That in no case have we seen any evidence of such resolution or absorption of inflammatory new growth when once it has become fully or-

¹ Williams: Diseases of the Eye, p. 327.

ganized: therefore we must reason illogically when we make hernia an exception to the general rule.

We have, then, seen the truth of the general law deduced by Billroth, and by Cornil and Ranvier, that all processes of repair tend to reproduce the tissue of the region where they are situated; that is, that these processes of repair are progressive in their nature until they attain a certain structure, which structure then becomes stable, as stable as normal tissue, and subject to the same laws of growth and decay. If a person has naturally weak abdominal fasciæ, how can any one expect a strengthening of one local portion to strengthen the whole abdominal area? In other words, it would be no unexpected event for a person to be permanently cured of an oblique inguinal hernia, and then to suffer afterward from a direct hernia. Is this an argument against the value of the method of subcutaneous injection? Yet many talk as if they thought it was. In other words, the return of a hernia once retained is not the only evidence that is essential. We must know, *first*, whether the fibrous tissue has ever seemed to be firmly organized, and, *secondly*, whether the new hernia is precisely in the same locality as the origi-

nal lesion. I have seen several cases, and am cognizant of others where it was not.

Clinical Experience.—We have lastly to consider the results of clinical experience. It is perfectly in accordance with the wise conservatism of medical and surgical science, that, before an operation shall become accepted and be admitted into general practice, it shall be able to produce as the result of a long and careful experience such a percentage of complete recoveries as to render its adoption and approval by the profession an advance in the progress of the healing art. The objection has, however, been made to subcutaneous injection for the cure of hernia, that only a few trustworthy cures have been brought to the notice of medical men. That there might have been a valid objection to the operation before I took it up, I will not deny; but certainly there has been some stimulus at work of recent years that has brought to the notice of the profession many trustworthy cases of the permanent cure of hernia by this method. It is now a number of years since I first operated for hernia by subcutaneous injection; and I well remember that when, about four years ago, I read a paper upon the subject before the

Suffolk District Medical Society, a worthy member thought two years of relief from the return of hernia would insure the permanence of the cure. Fully that time has now gone by, and I have still been operating; and, with few exceptions, I have not seen a case which, once pronounced cured, has had a return of hernia at the precise locality where I had operated.

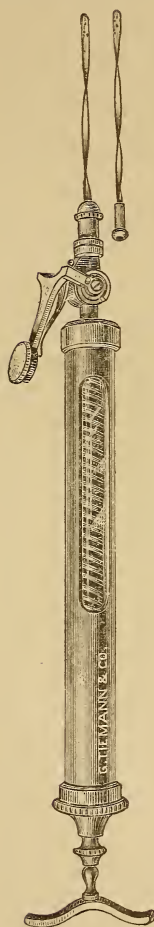
Nor do I stand alone in making such a statement. Many of my cases have been seen and thoroughly examined by my professional brethren both in this city and out of it, whilst the reports of other surgeons in this country in regard to their success are as emphatic and conclusive as my own. We certainly, then, are not at fault if successful cures are not yet known to the profession. Not only, however, have I met with success in arousing the profession to accept the operation as one of permanent value, but I have succeeded in proving it a safe procedure. Some of our best surgeons, who once considered it rather hazardous, have now emphatically said that the operation is free from danger. Nor is this all. There are few other operations that have presented, or that can present, such a list of favorable results in the practice of trustworthy

physicians. It is not necessary to quote cases taken from my own private practice. I trust it will be sufficient for me to say, that my own clinical experience, as well as that of other medical gentlemen, fully support whatever may have been said in favor of this operation.

Conclusion. — I have found, however, that there is an urgent necessity in the majority of cases for a more stimulating injecting fluid than the simple extract of oak-bark, and for an instrument which will more thoroughly and more effectually distribute the fluid upon the hernial rings and canal. Nevertheless, I should think that, for children of the age of four or five, the simple extract, or the formula which, in my treatise, I have called Formula A, amply sufficient. Upon infants and children under four years of age I still refuse to operate, because I consider the pressure of a good bandage or truss is better. There are surgeons, however, who operate upon infants in arms, and they report good results.

I attribute my success in the operation mainly to three things, — 1st, The use of a stimulating mixture (Formula C). 2d, The use of an instrument, the needle of which revolves and dis-

tributes the fluid more effectually than any instru-

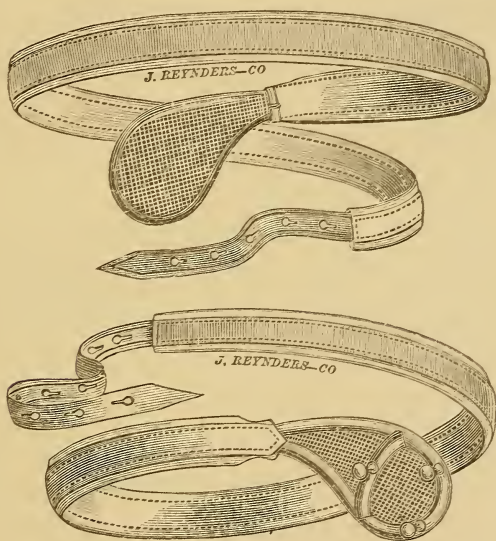


ment made under the pattern of a hypodermic syringe. (This instrument is finely made by George Tie-mann of New York.) 3d, The use of a truss as soon as possible after the operation. It is evident that an ordinary truss cannot be very early applied to the parts which are in a state of inflammation. For this reason I devised a truss, the pad of which is flat, and made of silver wire gauze. I call it the "Anatomical Truss." It tends to keep the rings together, rather than to force them apart, as every stuffed pad must do. External applications can be made to the parts beneath if they become irritated or inflamed, and it is light and capable of such accurate adaptation to the tissues that it can be worn constantly with perfect comfort to the patient.

I apply it eight or ten days after I have injected the hernial rings ; and the patient wears it night and day constantly for two or three months.

The truss is equally valuable for a patient who has had no operation performed, and will be found to give more relief than any padded truss.

To show the value of this truss it will be necessary to give only a few characteristic cases from my clinical experience, which has been by no means limited in this direction.



Mr. G., aged forty, with a large, direct hernia, was operated upon subcutaneously in the early part of the summer of 1881. Ten days after I injected him with my Formula C, I applied the anatomical truss, which he continued to wear

night and day. The result was a perfect cure of the hernia, so that he was able to abandon the use of the truss from that time. While he was wearing the truss he met with two accidents,—one a fall down a flight of stairs, the other a violent strain while righting up a coal-cart. Notwithstanding all this the result was a perfect cure of the hernia, so that he was able to abandon the use of the truss after having worn it three months.

Mr. C. McC. was operated on early in October, 1881, for a double oblique inguinal hernia of ten years' duration. Eight days after the operation I applied this truss, which he wore for three months night and day. During this time he slipped on the ice, and was slightly re-ruptured on the side where the large hernia had been. He consulted me about the first of January. I found the new hernia to be a direct one. I ordered him to wear the truss, and in April found him cured on both sides. He wears the truss now for safety whenever he is to undertake any heavy work requiring violent exertion.

Dr. D. was operated upon in November, 1881. He was fifty-four years of age, and was ruptured

on the left side when twenty months old by a nurse falling upon him while carrying him in her arms. The hernia was very large, the scrotum being filled and distended with intestine and omentum. All kinds of artificial supports had been applied without the least benefit. Finally, the parts became so irritable that no support could be endured. The doctor is a liberally educated, conservative gentleman, and a surgeon of experience in the late Confederate army. To give his evidence upon the value of the anatomical truss and operation, I quote from a letter written to me by him on May 22, 1882. He says, "My general health has been excellent since I saw you, and I am persuaded that the operation for hernia will prove an entire success. By strict observance of all your instructions, I have escaped all accidents, and feel as strong and sound in the region of the operation as I do upon the opposite side. I cannot imagine a case that could have progressed more favorably or promised better results. I have frequently placed my fingers on the truss-pad during the act of coughing and sneezing, to receive the impulse of the viscera, but cannot detect that there is any more sensible movement communicated by the pad

than the general vibration felt over the entire abdominal wall.

“ It is difficult for one like myself, who has been so long impeded in his movements, and who so suddenly regains or rather acquires strength and a feeling of security from danger, to restrain himself from excesses; and the effort to control my exuberant spirits is almost beyond my power of will.”

This was one of the most hopeless cases I ever operated on, and had the patient not been a physician, who knew how to take care of himself, I should not have undertaken the treatment.

To illustrate the well-known fact, that recent hernia may often be cured by wearing a truss persistently, even without any operation, I select the two following cases : —

Mr. W., a builder, aged thirty-five, referred to me by Dr. W., had a direct hernia upon the right side, of about the size of a hen's egg. I, being sick at the time, postponed the operation for six weeks, advising him in the mean time to wear a truss. At the end of this time I found the rings so firmly united and occluded, from the wearing of this truss night and day, that no operation seemed

necessary. At the time of writing this, the patient seemed cured, without operation.

Mr. B., aged thirty, applied to me in December, 1881, with a small hernia, caused by a violent fit of coughing. Being engaged with more formidable operations at that time, I deferred operation upon him for a few weeks, advising him meantime to wear a truss night and day. He neglected to present himself for operation until early in May, 1882, at which time I considered him entirely cured, and advised him to discontinue wearing a truss.

These two latter cases, as I have said, illustrate the well-known fact that recent herniæ can often be cured by persistently wearing a truss, even without any operation. If, then, hernia can be cured in its early stage by a properly adjusted pad, it is not surprising that old herniæ can likewise be cured by a suitable pad if once the fibrous rings are freshened and stimulated into activity by this operation of injection.

As it might be interesting to the reader to learn the result of my operations by the subcutaneous method, I submit a few in the following report.¹

¹ See end of chapter. There are also about forty cases from whom I have not heard. Presumably, therefore, they are cured, or they would have complained to me before now.

It will be seen that in this report of cases none are included that have not stood the test of two years of time since the operation, as I wish to apply a test of this length of time before reporting any of my cases cured, although I have operated on many since 1881 that to all appearance are permanently cured of their ruptures. Still I do not wish to report them until sufficient time has elapsed, that we may feel each case is permanently and soundly cured, and most thoroughly tested. In addition to these twenty-eight cases I should mention that I operated on two others not included in this report, that were not benefited except so far as a slight contraction of the rings made the retention of the hernial protrusion easier, and the wearing of a truss more comfortable. One, I feel confident, would be cured by one or more injections; the other I could not expect to cure, as it was a very large direct inguinal congenital rupture, and both rings were melted into one another. The operation was undertaken as an experiment from the first, as no expectation of a cure could be held out to the patient, and the person understood it; but he was anxious to try the operation. In none of these cases excepting one, was a second opera-

tion performed. In this one case the tissues over the hernia slightly protruded, but this protrusion was overcome by the second injection.

Synopsis of Subcutaneous Operation. — In view of the interest which has been shown in the method for the cure of hernia by injection, and owing to the fact that comparatively few are familiar with the method and its application, I have prepared the following brief outline of the method, thinking that it might be of value to the readers of this paper: —

This operation is no longer an experimental one, nor of doubtful expediency, but has been fully established as safe and expedient. Much of the success of the operation, however, depends upon the judgment of the operator, as shown in the selection of cases and in the after-treatment. The injection will cure cases of all ages; but the most favorable age is from four to twenty-one years. Before the age of four I do not think it expedient to operate. After twenty-one, more care is required to obtain good results; but the best results are often obtained in those of advanced age. Sex seems to have no influence for good or bad. Occupation may have an after-result in reproducing

hernia at the same place as the first, if too great a strain is brought upon the place too soon after the operation, or near it where the first hernia is retained, a direct rupture occurring through weakened abdominal walls.

As in all operations, the success is greatest, other things being equal, in those of a healthy state. Constitutional disease, however caused, retards the process of cure, and may prevent it. In such cases tonics (as quinine or iron), to counteract the general debility, and specific remedies (mercury, iodides, etc.), to counteract the specific diseases, are indicated; the operation being delayed until the system is built up.

Nervousness is to be considered on account of the time that is to be spent in bed on the back; and the nervous system, if highly excitable, should be toned down by appropriate remedies. An irritable spine is unfavorable to the operation.

The kinds of hernia enumerated in the order of the best results and least danger are inguinal, umbilical, and femoral. Large congenital herniæ in persons over forty are very unsatisfactory, as the two rings are practically fused into one, and there is no canal left for the injection to act on.

The hernia must be reduced. Herniæ apparently irreducible may often be reduced by patient trials. Taxis is to be aided by position, by ether, by ice-poultices, and by subcutaneous injections of sulphate of morphia and sulphate of atropia, combined or separately. Adhesions may be broken by manipulation or by subcutaneous division, or the tumor may be gradually reduced by an elastic cup-truss.

The hernia being reduced, the middle finger of the left hand is carried up into the opening of the external ring, the scrotum being invaginated. The reduced intestine is held back by this finger. The tip of the index finger, placed in its natural position by the side of the middle finger, points to the site of the puncture for the needle of the syringe. This puncture is opposite the external ring. It is not made through the scrotum, but through the skin of the abdomen in the inguinal region. The needle is passed carefully into the canal, avoiding the cord and the vessels. It is evident that the operator must be a good anatomist and a skilled surgeon. The finger being in position, the fluid is forcibly injected along the tract of the canal, — not into the sac, nor into the peritoneal

cavity. The fluid is still injected as the needle is withdrawn; and at the same time the needle is revolved so that every part of the canal shall be bathed with fluid. The syringe which I have devised for my own use does this automatically; for, on opening the valve by pressing the lever, the spring on the piston-rod forces out the fluid through the holes in the sides of the needle, which is at the same time rotated by the act of withdrawal, owing to its twisted form. I do not say that this instrument is necessary for a perfect result; but it makes the operation easier, and simplifies the injection, so that the result is more likely to be favorable. The common hypodermic syringe will not answer; for it delivers the fluid against the sac, and not on the walls of the canal; and the scarf-point is dangerous, as arteries may be wounded by it. An instrument which delivers the fluid only in drops is not of as much value as one that sprays the fluid forcibly upon the tissues.

When the injection has been made, the ring will be felt to contract like a sphincter round the tip of the finger, and from my experience I do not expect a favorable result unless I feel this contraction. When the needle is withdrawn, the finger is

to be placed over the puncture to prevent the escape of fluid.

This is also guarded against by making the puncture with the skin drawn tense, and thus making a valve-like puncture.

The amount of fluid varies with the size of the hernia and the irritability of the tissues. The larger the hernia and the older the patient, the more stimulating should be the fluid, and the greater the amount injected. Inguinal herniæ require the greatest amount, while femoral require the least, — about one-half as much as inguinal.

The fluid that I use is made according to one of the three following formulæ: —

Formula A. — For infants and children, whether the hernia be accidental or congenital.

R	Fl. ext. Quercus albæ	℥ij
	Reduced by distillation to . .	℥j
	Alcohol, 90 per cent	℥ij
	Ether sulph.	℥j
	Morph. sulph.	gr. ss.

M. Sig. Inject 8–10 minims.

Formula B. — For old and long-standing herniæ, whether congenital or acquired.

R	Fl. ext. Quercus albæ	℥iv
	Reduced by distillation to . .	℥j

Alcohol, 90 per cent	3ij
Ether sulph.	3ij
Morph. sulph.	gr. ij

M. Sig. Inject 10-25 minims.

Formula C. — Best in the majority of cases.

R̄ Fl. ext. Quercus albæ	℥vj
Reduced by distillation to	℥ii
Alcohol, 90 per cent	℥ss
Ether sulph.	℥ii
Morph. sulph.	gr. iv
Tinc. veratri viridis	℥ii

M. Sig. Inject 15-20 minims in small and recent herniæ,
but 25-50 minims in large or old herniæ.

NOTE. — This fluid will cause a marked reduction of pulse and temperature, and it may be necessary to put a hot-water bottle to the patient's feet. This reduction may last as long as forty-eight hours, and gives a decided advantage in obtaining a more decided local effect of the irritant.

By this combination I think that the best results will be obtained. Other remedies have been used, as iodine, ether, alcohol, sulphate of zinc, etc. The object of any fluid that is used is to cause irritation, and set up effusion. Carbolic acid and similar fluids will not effect this, and consequently are not of use.

The injection is performed with the patient lying in bed on his back, and, being completed, a com-

press and spica bandage is applied. Pain and restlessness are to be subdued by sulphate of morphia, and a compress of cold water may be placed over the site of the operation if the pain is intense. Quiet and maintenance of the position on the back are to be insisted upon ; but if the patient, for some urgent reason, turns upon his side, or is restless within the twenty-four hours following the operation, the success of the operation is not of necessity destroyed, although it is endangered. The bowels are to be moved just before the operation, and not again for several days. The urine may have to be drawn ; but this is the exception. Light food is to be given, and quiet maintained.

The slight fever that follows does not need medication as a rule. The injection is to be aided by rest and position, and by the pressure of a spica bandage. In eight or ten days, if every thing has gone well, the patient may stand up, the operator supporting the parts with the hand ; and, if the opening is felt to be occluded, we may fit a light truss, and let the patient go, cautioning him to favor himself for a short time. In a few months another examination is to be made ; and, if all is well, the truss may be dispensed with.

If, during the treatment, an abscess forms, it is to be treated according to the rule, being opened antiseptically, and constitutional symptoms met as they arise. An abscess should not occur, and shows that there has been an error in judgment, either in selecting the case, or in using too much or too stimulating a fluid. Every swelling is not an abscess. A swelling simulating an abscess may appear a few days after the operation; but in reality this is only effused lymph. This will be discolored by the injection, and look as if there was decomposing blood in it. A few days will decide whether this is an abscess or not, as it will either be absorbed, or else will "point."

As a final result we may confidently expect a cure. In extreme cases more than one injection may be necessary. In no case is the operation dangerous any more than hypodermic medication is dangerous; and, if it is not fully successful, it will at least better the state of the patient, inasmuch as it will contract the rings in a degree, and tend to retain the hernia by as much as the rings are contracted.

The object of the operation is not to set up inflammation in the sac, nor to cause peritonitis,

nor to set up an imaginative tendinous irritation. Neither does it avoid inflammation altogether. On the other hand, it aims to set up inflammation of a mild type in the fibrous tissues of the hernial canal and its rings.

PART III.

HISTORY OF MY CONNECTION WITH THE
METHOD OF SUBCUTANEOUS INJECTION FOR HERNIA.

THE following and some of the preceding papers which I read before the American Medical Association at Cleveland, O., June 7, 1883, were very generally and profitably discussed. Dr. William Byrd of Quincy, Ill., President of the Surgical Section last year, had operated five times with success, using Warren's instrument and Formula C. He thought very highly of the method when it was properly performed in accordance with the author's directions. Dr. Murray of Indiana had operated three times successfully, and wished to express his personal thanks to the reader for his paper, and thought the association and the profession at large should feel grateful for the thorough manner in

which he had brought the matter to scientific notice. The safety and great benefits of the subcutaneous operation have thus, by the author's labors, been fully demonstrated ; and the profession is daily recognizing and accepting it. Many other gentlemen testified to a personal and satisfactory experience with the operation.

To the question why the *veratrum viride* was used in my formula, I replied that by it a great reduction in the rapidity of the heart was obtained, the pulse sometimes falling to fifteen or twenty beats per minute. This reduction of the circulation enables us to bridge over the first forty-eight hours after the operation, so that there is less fear of a general inflammatory action. Thus, too, more of the irritant fluid can be injected, and a greater amount of local inflammation set up in the hernial rings, than would be possible with the simple extract of oak-bark.

Dr. Hallen of Kansas City spoke of two cases of abscess occurring after using, as he thought, the author's Formula C. This could not have been possible in his cases ; for, at the time of the operations, the formula had not been published. But, even if he had used this formula, it would not have

been strange if abscesses had resulted, because it is a very difficult fluid to prepare properly; and it is quite possible that in his fluid there might have been some impurity or foreign substance. Then, again, the instrument he used might not have been a proper one, or not thoroughly cleaned. We all know that from the simple injection of morphine, or from a vaccination, abscesses sometimes result; and yet this does not deter us from making use of these procedures when they are necessary. At any rate, the number of abscesses resulting from the two thousand operations of subcutaneous injections for hernia that I believe to have been performed have been remarkably few.

I have said the fluid I use is a very difficult one to prepare. For the benefit, therefore, of those wishing to prepare a satisfactory fluid, I take great pleasure in inserting here Mr. Richard H. Kimball's method of preparing it for me:—

FLUID EXTRACT OF OAK-BARK FOR PREPARING DR.
WARREN'S INJECTION FLUID.

Take of oak-bark in No. 50 powder 16 troy ounces; moisten with a mixture composed of glycerine 2 fl. ounces, alcohol, aqua $\overline{au}$ 7 ounces. Pack firmly in conical *glass* percolator, and add gradually of the mixture of glycerine, alcohol, and aquæ, until all has been added. Then add a mixture of

alcohol and aqua (equal parts) until it begins to drop from the percolator; then close the orifice with a cork, and macerate four days. Remove the cork, and continue percolation with a mixture of alcohol (3 parts), aqua (5 parts), until 14 fluid ounces have passed. Set this aside, and continue percolation until exhausted, adding a small portion at a time of a mixture in which the quantity of alcohol is diminished from that used in each preceding addition. Evaporate this product very carefully on a water-bath to the measure of 2 fluid ounces, and add to reserved 14 fluid ounces. Then continue the evaporation until the amount is reduced to 6 fluid ounces.

DIRECTIONS FOR PREPARING DR. WARREN'S FORMULA
C FOR INJECTION IN HERNIA.

℞	Fl. ext. oak-bark (Kimball's Formula)	℥ ii
	Alcohol, 90 per cent	℥ ss
	Ether sulph. conc.	
	Tr. Veratri viridis	āā 3 ii
	Morph. sulph.	gr. iv
	M.	

First place the extract of oak-bark in a suitable bottle; dissolve the morph. sulph. in the tr. Verat. virid.; shake well for a few minutes, then mix with the alcohol and ether; *gradually* add this mixture to that of the oak-bark, and shake. Place in an ounce-bottle securely corked, and protected from the light.

In the other formula the morph. sulph. should be dissolved in a few drops of distilled water, and added to extract of oak-bark; and the other articles in the same way as in Formula C.

The following is from my Address before the Surgical Section of American Medical Association at Cleveland, O. : —

In order that the profession may more fully appreciate my labors in developing the operation of subcutaneous injection for hernia, I feel that the time has come to relate to them in the fullest manner my earliest connection with the whole matter. Years ago, when this association failed in obtaining the secret of the operation from Dr. George Heaton, I was conversant, as were some of you also, with the fact that he had cured many of our patients of hernia in some mysterious manner. Later in life, Dr. Heaton employed me as physician in his family, and still later for himself.

In the acquaintance which then ripened into friendship, I once asked him what good he had ever done in his life for the profession of which he was a member. Musing a few moments he said, "Have I not cured thousands of cases of rupture?" — "Yes," I said, "we will concede this to be true : but it has been done, sir, in a selfish way, as I look upon it ; and I cannot see that you have done any thing to elevate your profession." To this he said,

“What would you have me do?” I answered, “Make public the secret you have hugged and guarded so faithfully for years.” But said he, “You know all about it. I have shown you how to perform it. You may publish it, and I will furnish you with reports of cases,” etc.

I, however, recommended a younger man for the work; and he soon, upon my approval, secured Dr. Davenport for an editor. But after the publication of the book, he came to me in great lament, lest some one who did not practically understand the operation should attempt it, and fail. Indeed, a case had been operated upon without success in one of our hospitals; and said the doctor, “They cannot, without personal instruction, properly comprehend just what I do. Besides injecting the rings,” said he, “you know that I am in the habit of rubbing and kneading the parts with my fingers to get up irritation sufficient to bring about adhesions. But, if one simply reads my book, he will think he understands the operation, and then will fail in his attempts to do it, and blame me for false pretensions. I reasoned with him, and told him, among other things, that his idea of the pathology of the operation was wrong, and that some de-

gree of inflammation must certainly be excited in order to obtain adhesions. Finally he decided to produce another edition of his book, with fuller explanations in it; but Dr. Davenport did not appreciate his wishes, and, indeed, soon after died: so that Dr. Heaton never published a second edition of his little book.

As patient after patient began to come to me, after Dr. Heaton's death, to show me that they had certainly been cured of rupture, and to beg that I would not let the operation fall into disuse, I could entertain, in return for such praise and regard for me, nothing but the tenderest feelings. Although I had at that time some doubts of the entire safety and propriety of the operation, which doubts I confided to a few of my professional friends, the enthusiasm of the patients was so spontaneous and entirely unexpected, that I resolved to do what I could to maintain their high esteem for me, and attempt to develop the operation to the best of my ability.

In my desire to be minute in this sketch of my connection with the operation, I trust I do not seem too egotistical; but I am earnest to have it thoroughly understood that I was led to develop

the operation, not because of selfish greed, but because of the number of patients who begged me to do something for them in their distress. I did not assume the operation; but it was thrust upon me in a most inexplicable manner. Long did I hesitate before accepting the extra responsibility; but, on the other hand, I knew that if I did not take up the burden, it would be sure either to die, or else fall into the hands of unscrupulous and irregular practitioners.

Thanks to my many friends, especially the editors of home and foreign medical journals, I have already accomplished far more than in my highest ambition I ever dreamed of doing; and yet, although I have freely given to the profession all the results of my labors in the matter, I do not allow myself to think for a moment that I have ceased to improve the methods of curing hernia. Every day I am learning new features in the successful treatment of the disease, and I shall as freely give all to the profession in the future as I have in the past.

And yet I have not been free from the seductive inducements of those who would prey upon a suffering humanity. Among others, I will mention the offer that one physician (and he an editor of a

medical journal) made to me. He said he was supported by medical men who authorized him to offer me twenty-five thousand dollars per year, with a hospital at my disposal of whatever description I would mention, if I would go to a large city he named, and operate for hernia. Another came, authorized to pay me any sum I chose to demand, if I would allow my method to be advertised in the daily papers. So greatly did these importunate offers annoy me, that I wrote the following letter to my friend, Dr. J. Collins Warren, editor of "Boston Medical and Surgical Journal:"—

51 UNION PARK, BOSTON, Sept. 29, 1879.

MR. EDITOR, — Will you please to insert this note in your valuable journal, for the information of numerous inquirers, and greatly oblige me?

Many letters are being addressed to me, inquiring about the new instrument and my method of operating for radical cure of hernia.

I would say that the instrument which I showed at the last meeting was made for me after my device and invention, and it does its required work very well; but I am now having another instrument made, which will be finer in every respect, and much more perfect, and will do the operation perfectly with greater certainty of success.

At our next meeting I hope to show this new instrument as fully perfected, and also describe my method of performing the operation.

I would add, that, although the operation is comparatively painless as I perform it, yet a marked inflammation sets in about the parts, attended with some considerable swelling, in the course of from six to ten hours after the injection of the rings. This, with some fever and constitutional disturbances, continues for from three to six days, when it gradually subsides, leaving the rings occluded from the exudation which follows the inflammation set up by the injection.

Unless this state above mentioned ensues, the operation will be of no benefit in contracting and closing the hernial rings.

By exciting as little inflammation as possible, as has been done heretofore, we get, it is true, some adhesion of the rings; and the hernia is retained for a longer or shorter time. But, from the fact that very delicate adhesions are formed from the slight inflammation and exudation, the hernia will most likely be retained for only a short time.

The exact amount of the injection mixture required must depend on the good judgment of the operator in each case. If the hernia is of long standing, and therefore large, it will of course take more than in recent cases, and those of small size.

It is my intention, as soon as I can obtain the time,

to give to the regular profession a detailed description of the operation, its method and results, in a legitimate way, and one which will, I trust, be acceptable to all.

I will, add for all concerned, that all offers of partnerships, money, and hospitals, that are now made me, and that may be hereafter offered, in any other than a regular and professional manner, will be rejected with that same contempt that I have always looked upon them.

I intend that this operation shall be given to the profession which I love; and I am certain that on full investigation it will receive the merit which it deserves.

I will further add, that, when I think proper, I shall establish a private hospital on my own account, and of this the regular profession will be informed.

Mr. Editor, I would not have detained you so long, but I wished once for all to reply to the contemptible offers and overtures which are made to me; and that I also wished to express my delight at the interest which is shown by the regular profession.

As soon as my instrument is completed, I will give notice at what places it can be obtained.

I have the honor to be

Yours respectfully,

JOS. H. WARREN. M.D.

Per C. E. W.

Dr. Warren, thinking the matter too personal, was unwilling to publish it at that time. I agreed with him in his decision; but I wrote it under great pressure, and with the feeling that I needed professional support and sympathy. Not only did I fear that the operation would fall into unworthy hands, but I saw with astonishment that some of the regular profession were inclined to give support, not to me, but to the pretensions of a man who had learned from me all that he ever knew of this operation.

In my desire for sympathy, I now sought my old and highly esteemed friend, Freeman J. Bumstead, M.D., president of Kings County Medical Society, New York. He had investigated the operation, and had conferred with Dr. Heaton in regard to a hernia upon the right side, from which he himself was suffering. He advised me to publish my method in all the medical journals, and then, as soon as possible, to produce a book upon the subject. "It must be made common property to the profession, or else," said he, "the irregulars will seize upon it, and take it from the hands of the legitimate practitioners." So it will be seen that even this duty of presenting myself so often in the

medical journals was not of my own choosing, but was in a manner imposed upon me.

And yet no one so well knows the many defects and imperfections in my writings as I myself know them. In part excuse for this, I have to offer my busy life as a general practitioner; for I have never devoted myself to this operation as to a specialty, nor have I expected to reap my greatest reward in or by financial profits. But yet—for I am neither rich nor poor in earthly goods—I thank my brethren in the profession for the many patients they have referred to me, and assure them that I remember their courtesy, friendship, and good feelings toward me. My greatest reward shall be that I have given and shall continue to give the results of my best endeavors freely to the profession; for in loyalty and faithfulness to the advance of our profession I allow no one to exceed me.

Having now, for the first time, fully related the history of my connection with this operation, I deem it necessary to offer a few friendly words of criticism upon the methods in which it is usually performed by the profession at large. The subcutaneous injection for hernia cannot be a successful operation until it is fully understood that something

more is to be done than merely to inject the hernial rings with a little of the simple extract of oak-bark, to apply a bandage, and, after a few days' rest, turn the patient over to his own care, thinking that a miraculous cure has been effected. For a few days or months the parts may, it is true, hold together after such an operation; but it will be only by the merest accident that this sham procedure will accomplish a permanent result.

In all my professional experience of over thirty years, I am free to say that I have never performed an operation that requires such constant care, pains, and patience, as this. The injection itself requires skill and care, and then the patient must be kept quiet in bed until the fibrous tissue shall have had time to become consolidated. I would here make mention of a very useful pin¹ for the application of the proper bandages for the operation. It is the invention of my son, Dr. C. Everett Warren.

Many operators seem to think, that, because the method seems simple, it can therefore be done in the most routine manner, and that, if patients are made to understand that the operation is not so simple a matter for the surgeon, as many would have them believe, they will refuse to be operated

¹ See illustration, p. 111.

upon, and so will force the method into disuse. This is not so: rather will sufferers from rupture refuse to be operated upon, if they see careless operators fail in operations where more painstaking and prudent men would possibly succeed.

I do not wish it understood that I am fault-finding or egotistical when I say that those who have used my instrument and my Formula C have been more successful than all other operators who have worked in their own ways. I do not intend to set myself up as the only authority in this operation; but I must maintain, that, if my success in curing cases of rupture is greater than the success of others, as it certainly has been, there must be a competent cause both for my successes and for their failures.

I fear that too often the surgeon does not take care, at the time of operation, to *feel the rings and surrounding parts contract upon the end of his finger while it is in position; and many a time it would seem that he has no very definite idea where the fluid has been deposited. Too often it is thrown into the pillars and surrounding tissues, and not into the rings themselves, especially into the inner ring.* Again, it must rest with the good judgment of the operator to

determine the proper amount of inflammation to excite.

Such is my faith in this operation, that I consider it only in its earliest infancy. So much have I learned from my experience with it, and so much has it developed in my hands, that my operations now are far more thoroughly performed, and are more successful, than were my earlier ones. I know just how much to expect from it, and can therefore judge what cases will be most benefited by its use ; for, in order to be successful, we must use rare judgment in this operation, as in all others, and select our cases properly. Whatever doubts and prejudices I formerly entertained in regard to the excellent and undoubted results of the method of subcutaneous injection for hernia have long ago disappeared ; and I feel confident that yours will likewise disappear, if you study the subject in a careful and unprejudiced manner.

Yet there are those, I must confess, who still pretend to be sceptical of the permanent success that we know we do obtain, and who maintain that this operation, like others that have preceded it, will fall into neglect and disuse. Such will not be its fate, if I am able to judge any thing of it by my

experience; for it is daily gaining strength, and patients are so well pleased with it, that I am, perforce, led to hope that soon herniæ of long standing will be a thing of the past. In all cases the sooner an operation is performed after a hernia has occurred, the better; and this is only the same principle that is now applied by the best medical men to the treatment of stone in the bladder, or of ovarian tumors.

But even then we cannot always promise a cure; for I suppose there is no operation in which we require so much the hearty co-operation of our patient, and his implicit obedience to our instructions, as this. Too often a successful operation is rendered a failure by the future life and habits of the patient, acting contrary to our commands. In conclusion, I recommend for your first patients those who have small and recent herniæ, and who are themselves young and healthy.

A few words as to the future of this operation. With the best wishes for success to every one who shall be encouraged to try this subcutaneous method, I thank this association for granting me the privilege of explaining my relations to the operation, and trust that it will never be allowed to fall into the hands of irregular practitioners. I

have succeeded, thus far, in curing fully ninety per cent of all those upon whom I have operated; but all must bear in mind that I have made a most careful selection of cases to be operated upon.

If all herniæ that present themselves are operated upon without discrimination, this average of successes will probably not exceed fifty-five or sixty per cent. But, even with such a proportion before us, we should not be justified with our present knowledge in refusing to operate upon cases that offer us even the least hope of success. Even if we do not succeed in closing up the rings, we shall at least contract them, so that the bowel can be more easily retained by a suitable truss. At any rate we shall do the patient no harm.

I am now engaged in some experiments looking to a development of this operation that shall place it beyond all doubt of cavil as the very best that has ever been offered to the profession. If all works well, I hope to be able to place the results before the profession in the early months of 1884. Then, if my efforts to advance the progress of surgery, as applied to the relief of hernia, shall continue to be appreciated as fully as they already are, I shall be amply repaid for all my great outlay of time and money.

PART IV.

A PLEA FOR OPERATIVE MEASURES FOR THE
RELIEF AND CURE OF HERNIA.¹

THE history of the last decade of medical and surgical art is everywhere pregnant with new ideas. Notable advance has been made in nearly every branch of abdominal surgery; for, although the operations of gastrotomy, gastrostomy, laparotomy, enterotomy, colotomy, nephrotomy, and lithotomy, are not new in surgical annals, yet so much has been lately done to perfect these procedures, that they are now scarcely to be recognized as the same operations that we used to know. I say nothing of lithotrity, because the operation does not involve abdominal section; and yet it comes so nearly within the circle of abdominal surgery, that not to mention it is to neglect that branch of surgery in which we can note the most advance.

None of these operations, however, is for the

¹ Read before British Medical Association, Aug. 1, 1883.

relief of an affection more distressing or more dangerous than a hernia; and yet the present age has not been active as it ought in devising means for the relief and cure of this complaint. The danger, pain, and mortality from hernia in all ages, sexes, conditions, and walks of life has far exceeded that from stone in the bladder; and yet mark the difference in the advance of operative procedures! While various operations have been proposed for the relief of hernia, little was accomplished, up to Sir Astley Cooper's time, that was really tangible and acceptable.

Moreover, as soon as a truss was found that would retain the rupture, it would seem that the profession gave their tacit consent to be directed in their efforts by the instrument-makers. This was practically the condition of affairs until Mr. John Wood proposed an operation, now honored by his name, although at first very coldly received by the profession. And it was many years before other surgeons thought it worthy of their imitation, although it had been a very successful procedure in Mr. Wood's hands, as he informed me in 1880. May honor be given to him for his patience and persistence in waiting and working until the profession

would give him hearing and recognition in his operation !

Besides Wood, we might mention the names of Pancoast and Dowell ; but their many trials to gain a hearing before the profession were likewise unheeded, and their many successful operations upon hernia have been well-nigh forgotten. Agnew, too, after attempting a modification of an old European operation with a complicated instrument, seems to have abandoned hopes of its success, and, unless he is incorrectly reported, is said to be unable to see any need of any operation so long as a truss can be procured to sustain the rupture. In the great body of the profession, however, there has been within the last two or three years a renewed activity to discover some remedial means which shall succeed in permanently restoring the ruptured parts to their normal condition. At present, too, the prospect of success in this search seems to be more encouraging, more particularly because the profession is losing its distrust in the suggestions that are made, and are more inclined than in former years to give respectful hearing to the claims of new procedures.

Indeed, when we consider the danger there

always is that a hernia once formed will become strangulated with possibly fatal results, I feel that we are warranted in assuming considerable risk, if need be, to afford some relief to the sufferer; and I believe, with many others of the profession, that the time is not far distant when it will be considered that one who does not operate in some way for such cases has neglected his bounden duty to his patients, and must be held accountable therefor. "If, as a body of surgeons," said Dr. Freeman J. Bumstead once to me, "we would only stop to consider how we should feel if we were obliged to wear a support or truss all our days, with the constant danger of fatality before us, we should be the very first to cry for some means of operative relief."

In the very great majority of cases of hernia the method of subcutaneous injection affords complete and permanent relief: but occasionally we meet with large congenital and irritable herniæ that can neither be retained by a truss, nor completely cured by injections unless frequently repeated; and yet something must be done for their relief. Feeling, therefore, the responsibility that rests upon the profession, I take this opportunity to suggest a new method of procedure that promises

most favorable results. Although somewhat similar to one proposed by Mr. Banks of Liverpool, yet in some features it differs materially and essentially from any that I have seen reported.

My method is as follows: An incision is first made much the same as in the operation of kelotomy, except that it is longer. The superficial integuments are now retracted, and the rings exposed to view. The intestines being fully returned within the abdominal cavity, the old protruding sac is excised by the galvano cautery to a level with the pillars of the ring. The edges of this sac are now seized with serrated forceps in the hands of an assistant, care being taken not to bruise the edges. The operator now, with animal ligatures that have been thoroughly carbolized in oil, draws the two edges of this sac together by a continuous suture, leaving the ligatures long at both ends. The assistant holds the gut by these ligatures instead of by the forceps, while the surgeon thoroughly freshens the pillars of the rings with the red-hot cautery. The pillars are next brought together, and the sac allowed to lie just beneath but in contact with them.

A needle armed with silver wire is now passed

deeply through the columns of the ring, and at the same time through the edges of the sac that we excised. This operation is repeated until sufficient sutures have been put in to draw the pillars well together. These sutures are then tightened either by twisting or by tying. The latter is the method that I prefer, because I can better judge the amount of tension, and am not so likely to produce a strangulation of the tissues. The ends of the carbolized ligatures are now cut off, the silver wire smoothed down so as not to cause irritation, and the external integuments stitched together with silver wire or silk. All that is needed to complete the operation is a compress of cotton treated either with thymol, boracic acid, or carbolic acid, and the application of a common spica bandage.

The distinguishing features of this operation are the excision of the sac by the galvano cautery, the freshening of the edges of the rings by the same instrument, and the stitching of the sac and pillars of the rings together. By means of this freshening of the rings with the cautery, and the union of the sac to the pillars, an abundant exudation of plastic material is thrown out, and a great increase in the strength and consolidation of the

new tissue is produced, so that the results of the operation are rendered very permanent. The following case will illustrate the success attending this method of procedure :—

June 25, 1883, with the assistance of my son, C. Everett Warren, A.B., M.D., and William F. Temple, A.B., M.D., I operated as above described upon Mr. I. Welch, age 40, a builder by trade, who had been suffering about a year and a half with an enormous oblique inguinal hernia, filling and distending the scrotum to an immense size. The intestine could not be retained with the largest-sized pad of any truss. After cutting down and freely exposing the rings, I passed the galvano cautery around the parts at a red heat, completely denuding the pillars of the fascia, and brought the rings together with eight good-sized silver sutures, finally closing the rings in a manner similar to that reported by Mr. Banks in the proceedings at this meeting last year. The external tissues were replaced and secured with six carbolized silk sutures, and a few strips of adhesive plaster; a compress of absorbent cotton and a spica bandage completing the dressing. But little suppuration followed. In the upper portion of the incision, to the extent

of half an inch or more, there was free suppuration for seven or eight days, and a small drainage-tube was inserted. At the expiration of twelve days the parts were entirely healed, and the hernia was completely retained within the abdominal cavity. The patient goes about with the parts supported with a spica bandage and compress, he seems and feels sound, and is apparently cured of his distressing affection.

I have made use of this method with the galvano cautery in three cases, all giving the most perfect results and satisfaction; and I trust, upon further trial, that this method of operation will prove efficient in curing and relieving many cases of large and long-standing hernia.

Considering the very satisfactory results which I have obtained in this mode of operating, I am led to highly recommend it to your most favorable consideration in many cases demanding operative measures; and I think, that, in cases of strangulated hernia, when herniotomy is performed, the rings might be freshened by the galvano cautery to great advantage.

As a duty to our patients, as well as affording a golden opportunity to ourselves as a profession

burdened with responsibility in the application of our art in relieving and curing as far as possible all who may call upon us to relieve and assuage their sufferings, I trust all noble and well-minded of the profession who may read or hear this imperfect paper will join the writer in this plea that something more may be accomplished for this large class of patients, suffering, and importuning us for aid in every civilized or uncivilized country in the world, and will alleviate this suffering by personal efforts and example, either by this method, or by suggesting something that shall be better.

With the little danger attending surgical operations, and particularly those of abdominal sections, as now practised, are we not warranted in our plea for something more to be done by operative measures for the ruptured? I, for one, feel anxious that more of the better class of the profession should take hold of this very important branch of neglected surgery (neglected in the past at least); and I hope that those engaged in large hospital and private practice will turn their best experience and resources to accomplishing rich results in perfecting this operation for the relief of the ruptured as they have in perfecting other surgical operations.

Should this paper by any means be a stimulus in calling attention to this subject, and arousing greater efforts in the matter under consideration, I shall feel that I have not made this plea in vain. May we not see in the near future something more in the text-books of surgery than the same old dull and unimportant recommendations of a truss to retain a rupture that persists in protruding, especially as in many cases, with this imperfect appliance, strangulation occurs, which, if not relieved in season by taxis or herniotomy, ends in death? These recommendations, and nothing more, have helped fill out the pages of every work on surgery, with a few commendable exceptions, for a hundred years or more, so copied and repeated, that, if we read any of the old and well-known authors, we shall get all the essentials, at least, of a great portion of what the most modern authors have to say, and shall be surprised to learn how little has been added by the recent writers on this subject. It is very strange indeed, to see how all decry and ridicule any way of relieving and curing the ruptured by any operative measure beyond wearing a truss; and, more than this, not one in ten of the writers or practising

medical gentlemen of to-day know how to fit a truss properly. They are not taught it in any of the hospitals or medical colleges; but, with few exceptions, all refer their patients with rupture to the tender mercies of the tradesman or mechanical-instrument maker. Should we not, as a profession at large, be ashamed of so glaring a neglect of this most important duty? I myself, and no doubt others, have seen patients who were fitted by these men, wearing trusses in such a ridiculous and laughable manner as to be in reality a cause of hernial protrusion of greater size than was the rupture in the beginning. I have been repeatedly informed by many a patient that a rupture, small at first, rapidly grew larger by the application of a truss improperly fitted. Would any surgeon think of allowing the same class of men to fit a splint to a broken limb? and yet how much more important is a well-fitting truss to the comfort, safety, and life of our patients with rupture, than a splint to a fracture!

PART V.

THE PROPER FITTING AND WEARING OF A TRUSS.

THE value of a truss may not be wholly to prevent an increase of a hernia already existing. It may also be curative in closing up the hernial rings if properly applied to the right case and in sufficient season. In any given case the surgeon's duties are twofold. He must in the first place select the proper truss, and then he must properly apply it, and give instructions for its use. Neither of these duties should be delegated to the instrument-maker, but should be done in person.

A truss cannot be manufactured upon abstract principles. It must be the result of careful anatomical study, and must be adapted to the age, sex, and condition of the patient who is to wear it. It must combine, moreover, lightness, strength, and

elasticity, so that it may be worn continuously and with comfort. A spring that is too feeble to retain the protruded intestines is a deception, for it gives to the patient the mere appearance of safety without any of the reality. On the other hand, a spring that is too stiff may do more harm than good by causing absorption of the abdominal parieties upon which it presses.

Perhaps, however, the most important portion of the truss is the pad. Most of the trusses in common use are fitted with a hard and convex pad. This by its very hardness is uncomfortable to wear, while by its convexity it is tending constantly to stretch and weaken the intercolumnar fasciæ, and thus to enlarge the hernial rings. The pad should never be of such a shape as to press in upon the tissues, or to invaginate them within the hernial canal.

The most perfect support for a hernia is the human hand. Being slightly *concave*, it accurately fits the slight convexity of the abdomen at the groin. But the human hand is not available for this purpose: and the best substitute for it is a truss with a pad shaped as nearly as possible like the hand; i.e., flat, but with a very slight concavity,

which can be easily shaped by the surgeon to the particular abdomen under consideration. Such a support is my Anatomical Truss (see "Practical Treatise on Hernia," second edition, p. 321) now lately modified (see present book, p. 47).

Having selected the truss proper for the given hernia under consideration, the surgeon must next use judgment in applying it. The pad must be of such a size as to overlap the hernial rings by half an inch on all sides, and should be so fixed to the spring as to exert a pressure at right angles to the plane of the hernial aperture. Thus, in a subject with a large abdomen and an inguinal hernia, the pressure should be upward, or upward and inward; while in thinner subjects it should be directly backward. In femoral hernia the pressure should always be backward in order to close the crural ring.

In *oblique inguinal* hernia the pad should be placed over the internal ring and canal, and *not* over the external ring. In *direct inguinal* hernia, on the other hand, the pad must be over the external ring. In *femoral* hernia, when the crural arch is natural and not relaxed, a small pad may be applied over the neck of the sac; but, when the arch

is relaxed, the pad should lie upon the ligament itself. This latter rule should always apply to a femoral hernia that has been relieved by herniotomy. There is one other point that is often forgotten, although it would seem to be almost self-evident to a good student of anatomy. The pads of a truss should always lie *above* the pubic bones, because both the inguinal and femoral rings lie above these bones.

To test the value of a truss for any given hernia, the patient should be made to cough and strain, and, when possible, to jump; but I would not have him do this often and again to satisfy his own curiosity. Such a course is very reprehensible and dangerous, besides accomplishing no possible good. After a competent surgeon has decided that the truss is well adapted to the case, and properly fitted, he should instruct the patient in its proper use. He should inform him, that so long as the hernia fails to descend, or cause a dragging feeling in the groin, so long is the truss efficient; and he should warn him against useless experiments foolishly designed to test the value of the support.

To measure for a truss, the circumference of the pelvis, taken one inch below the crest of the ilium,

should be given, also the girth of the body beginning and ending at the hernial orifice, and the distance from the hernial opening to the iliac spine. It is well, also, to indicate to the instrument-maker the directions in which the pad is intended to press ; and these directions should be determined by digital examination while the patient is standing. Patients who have laborious occupations should have two trusses, — one for ordinary wearing, and the other for occasions when extra exertions must be made. It is safe, also, to have an extra truss on hand, especially when travelling, so as to provide for accidental breakage of the truss that is worn.

Of course there are many intricacies in the adjustment of a truss that have not been explained here. They can be learned only by experience and good judgment on the part of the surgeon. What I have endeavored to do is to outline the most important rules that are of value in every-day practice.

A few words to the wearer of a truss. It is absolutely necessary that the supporter should always be upon the body whenever the person is in the erect position. It were well, indeed, if this could be worn continuously, by night as well as by day ;

but, if it be found inconvenient or uncomfortable to wear it in bed, it may be removed after the wearer has assumed the horizontal position. Never, however, should he allow himself to rise from this horizontal position before he has properly applied his truss.

These precautions may seem to some too strict, but it is only by attending carefully to them that the full value of the truss can be obtained. It may be that for months the wearer may, without any accident, arise from bed to the erect position, holding the hernia up by the fingers, and then applying the truss; but there will always be the immediate danger that some time the hernia will in this way partially descend, become strangulated before the patient is fully aware of his danger, and entail upon him the most fearful consequences. More than this, no one can by any possibility calculate when this time may come. The best rule, then, is the rule of precaution. The patient should always apply his truss to his hernia *before* he has assumed the erect position, and should never remove it so long as he remains in that position.

PART VI.

CAUSATION OF HERNIA.

IN considering the causation of hernia, three factors are to be taken into account; viz.,—

1. The containing or retaining parts.
2. The contained parts.
3. The causative force, active or passive.

Containing or Retaining Parts. — The abdominal cavity may be compared to a cylinder closed at the top and bottom. The diaphragm forms the cover, and by its movements increases or decreases the size of the cavity. A portion of the circumference of the walls of the cavity is rigid and firm, but by far the greater portion is yielding. The bottom of the cavity is formed by the perineal region and the pelvis. These walls are made up of skin, muscle, fascia, peritoneum, and bone; the number and quantity of each,

as well as the absolute and relative arrangement, varying with the locality.

If the tissues forming the walls were in all places continuous and of equal thickness, the viscera could only escape the proscribed limits by a forcible breach of continuity. It is owing to the mistaken idea that such a breach of continuity does occur, that the word "rupture" or "breach" is commonly applied to hernia. In reality, a direct rupture of the walls rarely occurs. If it does occur, it is the consequence of traumatism (punctured wounds, as those of a knife, spear, arrow, or some similar article, gunshot wounds, blows or falls), or as a result of disease (abscess), causing inflammation, ulceration, or suppuration. The breach of continuity may take place from without inwards (abscess, suppurating bubo), or from within outwards (peritonitis, perityphilitis), and may be partial or complete; the size of the tumor, as well as the amount and character of the displaced viscera, directly depending upon the depth, extent, and location of the wound. The formation and the causation of traumatic hernia is sudden, and easily understood, as we have active and present causes.

Cases of traumatic hernia are, as has been stated,

very rare ; and the majority of herniæ are due to a protrusion of the viscera through breaches of continuity in the containing walls normally existing as such, but only abnormally existing as open rings or canals. These openings serve, —

1. For the passage of vessels and nerves, as the spermatic cord in the male, and the round ligament in the female in the inguinal canal ; the passage of the femoral vessels and nerves in the femoral or crural canal ; the umbilical vessels in the umbilicus in foetal life ; the aorta and nerves in the aortic opening in the diaphragm.

2. For the passage of food into the body, and the passage of excrement from the body, — the œsophageal in the diaphragm ; the meatus urinaris, for passage of urine ; the anus, for passage of fæces. In addition, the vagina forms in the female a very large and important opening.

In addition to these, the presence of foramina (*obturator foramen*, etc.) must be recognized ; but these are normally closed by the tissues traversing them and by membranes across them, so that hernia through these is due to direct rupture of the covering parts.

Inasmuch as these weak points exist in every

normally formed person, all are in a degree pre-disposed to hernia; but, unless abnormal factors are brought to bear, hernia does not occur, inas-much as the walls of these openings are closely applied to the contained tissue, so that the *canal is never normally open, and exists as a canal only in name.*

These abnormal factors are: —

1. Passive decreased power of retention, due to congenital malformation or to predisposition, hereditary, or acquired by injury or disease.
2. Active increased pressure of viscera, tend-ing to force the viscera through the weakened points.

These two may act alone, but usually act in unison.

The *fœtus in utero* may be affected with hernia as a result of retarded development, and failure of the constructive process. This commonly occurs at the umbilicus as congenital umbilical hernia, and in this case the intestine and other viscera may never have been within the abdomen. The development at the umbilicus may be normal, but the birth may be retarded from causes depending on either the mother or child; and the excessive

pressure brought to bear upon the child by the mother's efforts in parturition may cause hernia. The mother may affect the child, and predispose it to hernia, by disease acquired before or after conception. Such predisposition is usually due to non-development, the result of insufficient (anæmia) or perverted (syphilis, cancer) nourishment. The accoucheur may cause a hernia by cutting the cord too short, for in many cases the bowel projects some distance into the cord.

Normally, the umbilicus should be closed by a firm cicatrix at the end of four months; but the ring may remain open, or be insecurely closed, causing hernia later in life, if not during infancy. Inflammation or suppuration may ensue after birth, and a troublesome hernia result.

The inguinal canal may fail to close, and hernia be allowed. The peritoneum may fail to seal the canal through which the testis descended, and a congenital inguinal hernia may be allowed (vaginal when the whole canal is left open, and funicular when the canal is partially closed). A retained testicle may simulate hernia. Hernia, as a rule, if occurring during early childhood, occurs on the side on which the testicle descended last (the right).

In early life the two rings of the inguinal canal are nearly apposed, and a hernia at this time very much resembles a direct hernia of adult life. As development goes on, the internal ring recedes and ascends, making the inguinal canal, which at first did not exist. If the hernia can be retained, the natural process of development will, it is evident, tend to close the canal against the descent of the viscera. A truss, therefore, may, in such a case, aid the result by maintaining the viscera in the abdomen; but it can exert no curative effect, being simply accessory to natural processes. In old age the reverse process goes on where a hernia has existed for a long time, the rings approaching each other instead of receding. It is evident that a truss does not have the same aid from nature as in the former case, and it cannot effect a cure unaided.

Before puberty, the child is more liable to hernia than later. In addition to the greater risk of injury incurred, the diseases of childhood have a direct influence in weakening the retaining parts, and also in increasing the active agents. Most important in this regard are whooping-cough and croup, and all diseases characterized by, or at-

tended with, convulsions. Syphilis, rickets, struma, tuberculosis, and hip-disease may cause hernia.

Deformities, especially those of the spine and femur, are productive of hernia, as they directly weaken the system, and throw the weight of the viscera against parts not intended or adapted to sustain them. Naturally, the weight of the viscera falls into the pelvic cavity; and any agent tending to change the direction of the weight and pressure is injurious.

During the period from twelve to twenty years, the body is in its full vigor, and hernia is least likely to occur during this period.

In adult life the body is naturally deteriorating, and this natural decline is aided by errors in dress, diet, and occupation, by abuse of the natural functions, and by accident or disease.

Other things being equal, inguinal hernia is more common in man, owing to the larger size of the inguinal rings. Femoral hernia is more common in women, owing to the deeper and wider femoral arch and the smaller muscles in the space. Owing to the presence of the uterus, woman is less liable to hernia of any kind than man, since the uterus acts in a degree as a compensating balance

of forces. Hernia in the perineal region, however, is more common in woman, owing to the laxity of the tissues.

Errors of dress are those where the abdomen is tightly constricted and the space decreased by tight waist-bands or belts, and by corsets or abdominal supporters. High-heeled shoes, too, may aid in the causation, — directly, by diverting the direction of pressure of the viscera; or, indirectly, by tripping the wearer up, and wrenching the body. Errors in diet are those where an insufficient amount of nourishment is taken, causing a weakening of the abdominal walls. This may be unavoidable, owing to poverty, or to diseases causing loss of appetite. The diet may be too constipating, and cause straining at stool, and, as a result, hernia; or it may be too laxative, and be as injurious. Debauchery, resulting in enervation and constitutional trouble, is a common cause of hernia. This is especially the case with prostitution and libertinism, owing to the diseases induced thereby.

Diseases predisposing to hernia are those causing great depression of the vital forces, and attended with or followed by injurious complications. Such are typhoid-fever, anæmia, leucocythæmia, yellow-

fever, diphtheria, etc. Diseases of the air-passages, especially where breathing is interfered with, or where there is constant cough or dyspnœa, may have a direct influence. Some diseases of the heart, causing dyspnœa, may be considered. Diseases accompanied with tenesmus, as dysentery, and those accompanied with vomiting, as yellow-fever, are active as well as passive.

In considering diseases of the abdominal organs, it may be stated at the outset that any disease resulting in hypertrophy of an organ or in a neoplastic growth may be a cause of hernia by decreasing the capacity of the cavity, and at the same time increasing the pressure. Atrophy may act in a negative way. Abscess of various organs may follow inflammation, and the pus may burrow through the abdominal walls. Peritonitis may ensue, or may extend by contiguity from an inflamed organ. This is very likely to happen near the uterus and adjacent organs. Gastritis is an active as well as passive agent, on account of the vomiting attending it. Enteritis may be indirectly concerned. Constipation and diarrhœa are not to be overlooked. *Prolapsus ani*, *fistula in ano*, hemorrhoids, external and internal, and fissure or

stricture, must be considered as active causes. In short, any cause tending to weaken the abdominal walls, and to decrease the resistance from without, — the pressure from within not being correspondingly decreased, but remaining normal or being increased, — or any cause tending to increase the pressure from within, — the resistance not being correspondingly increased, but remaining normal or being decreased, — may cause hernia. Decreased resistance of the abdominal walls, and increased pressure upon the abdominal walls, acting separately or in unison, may cause hernia. If the resistance is increased with the pressure *pro rata*, the hernia will not occur as a rule, but may occur in consequence of stretching; or, as is sometimes the case, long-continued and constant pressure may, after a while, tire out the resisting muscles, and so overcome the resistance.

To understand the *rationale* of the causation of hernia, the comparison of the abdomen to a cylinder, having weak points in its walls and closed at the top with a shifting cover, must be kept in mind. Normally, the rise and fall of the diaphragm is attended by compensatory movements of the abdominal walls; and the movements of one

are counterbalanced by those of the other, so that the relation of pressure and resistance is maintained equal. The pressure in the abdominal cavity may be increased by engorgement of the viscera (stomach with food, bladder with urine, rectum with fæces), or by enlargement of the viscera, due to disease (congestion, hypertrophy) or to neoplastic growths. Since the muscles comprising the abdominal walls serve as motors as well as retainers, there is necessarily a greater amount of resistance in the abdominal walls than is necessary to resist the internal pressure. Accordingly the pressure may be increased beyond the normal limits, and yet not cause hernia, provided that the abdominal walls are not weakened; but if the pressure is constant so as to tire out the resistance, or if the whole constitution is involved, or if the pressure increases beyond the power of resistance, the tissues can no longer retain the viscera, and a hernia may occur.

The amount of resistance, therefore, is an important factor, as well as the amount of pressure; for increased and varying pressure is guarded against by an extra amount of resistance over and above that required to counterbalance the normal press-

ure: but, if the resistance is weakened, there is no safeguard, since the pressure is not decreased, but is relatively increased, although absolutely normal.

The recent and assigned cause is seldom sufficient by itself to account for a hernia. The assigned cause, as a rule, acts upon parts already weakened by injury or disease; and this weakening of the retaining parts may be the result of several forces acting consecutively or in conjunction. For this reason, in recording the causation of a case of hernia, the past history of the patient must be considered, especially as regards disease of a wasting type, or characterized by convulsions, vomiting, tenesmus, excessive cough, etc. Family history is of importance, especially in regard to history of disease which is hereditary.

Present and previous occupations should be definitely recorded. Occupations requiring straining efforts are especially productive of hernia; but, on the other hand, those in which no bodily exertion is required may, by the lack of exercise, predispose to hernia. Occupations requiring pressure upon the abdomen by tools or weights are to be considered.

The present state of health of the patient may

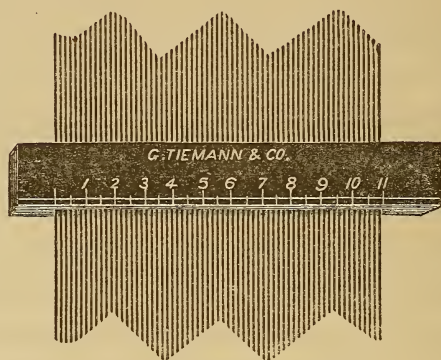
be of interest, and several questions have been inserted relating to this. Aside from questions of causation these may have a direct bearing on the treatment and its results.

To enumerate *all* the diseases that might predispose or actually produce hernia would be an endless task. A few of the more important ones have been tabulated ; but many have been omitted which no doubt may cause hernia indirectly, and many have been inserted which may have no connection. Any one who has attempted to draw up such a form will understand the difficulty of deciding what shall be kept and what discarded.

The remarks on the causation of hernia are intended more as suggestions than as dogmatic statements. For the purpose of obtaining statistics on the subject a table has been prepared, and is here inserted. I shall be pleased to furnish these tables to any one willing to aid me in this purpose. In using the accompanying diagram, the outline-figure is to be superimposed over the diagram, the crosses on each coinciding. The situation of the various kinds of hernia will then appear on the outline-figure, and the required record can be made with ink. This plan has been applied by me to other

portions of the body, as the thorax for recording heart and lung trouble, and the bones for recording fractures.

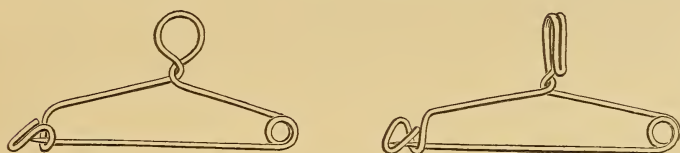
The size of the hernia should be recorded in definite figures, stating the circumference at the base and the distance over the tumor in two direc-



THE CONFORMATEUR.

tions at right angles to each other. The contour may be recorded by using a strip of lead, or, more easily, by the "conformateur," an instrument which I have used in many cases besides hernia. This was made for me by George Tiemann & Co., and consists of a frame composed of hard rubber sides, between which is a soft rubber lining. Through this soft rubber lining a number of

small steel wires play freely when pressure is applied, but are held in position by the soft rubber when the pressure is removed. In use this is placed perpendicularly over the tumor, and the frame gently pushed down. The wires will then adapt themselves to the outline of the swelling or deformity, and the contour may then be transferred



to paper by laying the instrument on its side, and carrying a pencil along the ends of the wire.¹

It is quite essential that the diagnosis of hernia should be correctly made before the causation is discussed. Rules cannot be laid down for all cases. The size, shape, consistency, definition, mobility, condition of skin, pain, tenderness, fluctuation, pulsation, translucency and cough-impulse, must all

¹ The figure of the pin inserted with the conformateur (referred to on a previous page) will be found of use in applying the bandages in the treatment of hernia, or other cases requiring the occasional unfastening of the bandage. They were first used by me in October, 1881. I have found them of especial advantage in applying the obstetric binder.

be considered to make a differential diagnosis. Having clearly ascertained these, the accompanying tables may be of some service in deciding the question ; but there are many obscure cases where there must always be more or less doubt, since the symptoms are so vague or confused that no decision can be positively made. In such cases the *history* is an invaluable aid in clearing up matters.

No. 1.]	Shape, Colour, Translucency.	Location, Weight, Size.	Advent and Development.	Perussion and Auscultation.	Palpation.	Cough Impulse and Fluctuation.	Inguinal Canal.	Spermatic Cord.	Bowel.	Reduction.	Addenda.
Indirect Inguinal Hernia.	Flask-shaped.	Frequently scrotal and often very large.	Advent Sudden.	P. Resonant.	Soft and doughy. (Enterocoele.)	Present.	Filled.	Usually concealed behind neck of sac.	Possible embarrasment.	Pressure outward and backward. Usually reducible.	Pulsation of deep epigastric artery concealed.
Direct Inguinal Hernia.	Globular.	Seldom scrotal and usually small.		P. Flat.	Hard when it is epiplocele.		Empty.	Outside of the neck as a rule.		Pressure directly backward.	Epigastric often felt pulsating outside the neck.
Scrotal Hernia.	Smooth and regular. Flask-shaped.	Scrotum. Weight: light.	Sudden.	P. Usually resonant. A. Gurgling.	Soft and doughy.	Present in majority of cases.	Usually filled.	Concealed & displaced by neck of sac.	Occasional embarrasment.	Pressure backward & outward unless strangulated, incarcerated, atelectic or irreducible.	Seldom painful unless inflamed or strangulated.
Sarcocoele.	Often nodular and irregular in outline.	Testis e. Weight: heavy.	Grows slowly as a rule.	P. Dull or flat. A. Negative.	Hard and resistant.	No impulse.	Empty.	Surrounds the cord.	Never affected.	Irreducible.	Frequently painful.
Scrotal Hernia.	Flask-shaped. Opaque.	Scrotum. Weight: light.	Develops suddenly from above downward.	P. Resonant.	Soft and doughy.	Fluctuation absent.	Filled except when direct Hernia enters scrotum.	Usually concealed by neck of sac.	May be embarrassed.	Usually reducible.	Aspiration negative.
Hydrocoele of Testicle.	Pyriform or ovoid. Translucent.	Tunica vaginalis. Testis.	Develops slowly from above upwards.	P. Dull or flat.	Hard, tense, and elastic.	Fluctuation well marked.	Empty.	Neither concealed nor displaced.	Never affected.	Never reducible.	Fluid withdrawn by aspiration or tapping.
Scrotal Hernia.	Smooth and regular in outline. Colour: normal.	Scrotum on either side. Weight: light.	Develops suddenly.	P. Usually resonant.	Smooth on surface.	C. I. Usually present. F. Absent.	Usually filled.	Concealed and displaced.	May be embarrassed.	Reductible by taxis only.	Effect of heat: negative. Return of tumour prevented by pressure at external ring.
Varicocele.	Knotty and irregular. Colour: bluish.	Most frequent on left side. Around spermatic cord.	Develops gradually.	P. Dull.	Feels like a bag of worms.	C. I. None. F. May exist if vessels are large.	Uninvolved.	Not affected.	Never affected.	Often reduces spontaneously in position which favours increased venous return.	Effect of heat: tumour increases. Tumour returns in standing position in spite of pressure at the ring.
Scrotal Hernia.	Flask-shaped, tumours due to direct Hernia. Colour: normal.	Scrotum. Weight: light.	Develops suddenly from above downward.	P. Usually resonant. A. Gurgling.	Soft and doughy.	F. Never present.	Usually filled.	Concealed and displaced.	May be embarrassed.	Usually reducible.	No constitutional symptoms except when strangulated or severely inflamed.
Hæmatocele of Testicle.	Pyriform. Infecund is hæmolytic.	Tunica vaginalis. Testis. Weight: heavy.	Suddenly if of traumatic origin; slowly if spontaneous. Grows from below upward.	P. Dull or flat. A. Negative.	Soft at first but hard after coagulation occurs.	F. Always present until coagulation occurs.	Empty.	Not affected.	Never affected.	Irreducible.	Fallor: Great prostration often present from loss of blood.

No. 2.]	Location. Weight, Size.	Advent and development.	Percussion and Auscultation.	Cough Impulse and Fluctuation.	Bowel.	Reduction.	Addenda
Femoral Hernia	Often felt deep in groin. Movements restricted.	Usually due to some severe muscular effort.	P. Resonant. A. Gurgling.	C. I. Present on flexion and adduction of thigh with body bent forward. F. Never present	Often embarrassed.	Reduced by pressure downwards, backwards, and upwards.	Tumour always solitary. Rare in the male sex.
Enlarged gland.	Always superficial. Great mobility.	Scrofulous diathesis.	P. Flat. A. Negative.	C. I. None F. Often detected.	No embarrassment.	Irreducible.	Tumour <i>seldom</i> solitary. Equally frequent in both sexes.
Femoral Hernia	Neck of sac lies internal to femoral artery.	Usually due to severe muscular effort.	P. Resonant.	F. None.	Intestinal derangement often present	On pressure downwards, backward, and upward. Distinct and <i>sudden</i> disappearance with gurgling.	Pain frequently absent. Tumour remains reduced in recumbent position.
Psoas abscess.	Neck of sac external to femoral artery.	History: Spinal disease or pelvic affection.	P. Dull or flat.	F. Often occurs if tumour is superficial.	Bowel acts normally.	Disappears <i>gradually</i> on direct pressure. No gurgling.	Pain in back or loins <i>always</i> precedes development. Tumour returns after removal of pressure.
Femoral Hernia.	Directed obliquely across the thigh. Usually small	Severe muscular effort.	P. Resonant. Often exists.	C. I. Present on flexion and adduction of thigh with body bent forward.	Often embarrassed.	By pressure downward, backward, and upward with a sudden slip and gurgle.	Tumour usually hard and tense; may be doughy. Skin of normal colour. Return of reduction prevented by pressure over femoral ring when patient is standing. Heat has no effect on size.
Varix of saphenous vein.	Lies in longitudinal axis of limb. Variable in size.	History and increased size of veins below crural ring.	P. Flat.	C. I. Often absent but may exist.	No embarrassment.	Reduction gradual by direct pressure in recumbent position. No gurgle.	Soft and indistinctly fluctuating, often discoloured. Tumour returns when patient stands in spite of pressure at femoral ring. Increased by heat.
Femoral Hernia	Small and well-defined in outline.	Advent sudden.	P. Resonant. May exist.	C. I. Often detected with thigh flexed and adducted and body bent forward	Intestinal embarrassment not infrequent.	Usually reducible.	Tumour often hard. Symptoms in common. Tumour in upper part of the thigh, " inside of femoral vessels, " external to pubic spine, " below " " Tumour <i>always</i> doughy.
Lipoma of femoral canal.	Not well-defined in outline. May be large.	Develops slowly.	P. Dull.	C. I. Never present.	Bowel's not affected.	Irreducible.	
Femoral Hernia.	Neck below Poupart's ligament. Usually small and round.	Spermatic cord. Internal to and in front of neck of sac.	P. Frequently dull.	Femoral pulsation. Felt external to neck when finger is in the canal.	Spine of pubes. Internal to neck of sac.	By pressure downward, backward, and upward.	Tumour if elongated lies obliquely across the thigh and never enters scrotum and labia.
Inguinal Hernia.	Neck above Poupart's ligament. Often very large and flask-shaped.	External and behind neck of sac.	P. Resonant.	Finger in the Femoral canal detects no pulsation.	External to neck of sac.	<i>Indirect</i> : By pressure outward and backward. <i>Direct</i> : By pressure directly backward.	Tumour if elongated is often scrotal in situation.

No. 3.]	Location.	Advent and Development.	Reduction.	Age.	Neck of tumour and appearance.	Palpation.	Navel.
Ventral Hernia.	Most frequent between Recti muscles of abdomen.	<i>Never</i> congenital. History : Traumatism, abscess or weakening of abdominal walls.	Often somewhat difficult.	May occur at any age.	Neck is well-defined.	Edges of opening in abdominal walls can be felt.	Present and in normal position.
Umbilical Hernia.	Bulging at the navel. Navel therefore absent.	<i>Often</i> congenital. History of traumatism or abscess <i>seldom</i> present.	Effected by mere pressure.	Most frequent in infants.	No apparent neck, but only a bulging at the navel. Usually spherical.	No unnatural opening can be detected.	Absent : tumour supplies its place.
Thyroid Hernia.	In the thigh near the inferior commissure of vulva. Seldom found in male sex.	Budden.	Reducible.	Occurrence.	In the old and emaciated neck is felt from outside the body. In obscure cases a vaginal or rectal exploration is necessary.	Symptoms in common.	
Perineal Hernia.	Perineum above rectum. In both sexes			Often impossible to detect when small.	Not discernible unless protrusion is extensive and involves perineum. Origin easy to decide if tumour is pronounced.	Sudden advent. Resonant percussion. Reducibility. Cough imparts as a rule. Possible intestinal embarrasment.	
Diaphragmatic Hernia.	Passing through diaphragm.	Sudden advent of protrusion into the thorax known to the patient.	<i>May possibly</i> be reduced by manipulation and position.	Percussion.		Thirst.	Peritonitis.
Mediastinal Tumours.	High up in the thorax.	No marked or sudden symptoms until the size creates pressure.	Irreducible.	Tympanic or localized dullness low down in mediastinum or thorax if hernia is superficial.	Gurgling.	May be extreme.	Symptoms rapid if tumour is extensive.
				Localized dullness.	Negative. If aneurism exists a bruit is heard.	<i>Extreme</i> thirst is absent.	Never produced
Congenital Hernia.	Inguinal canal distended and involved.	Occurrence <i>sudden</i> . May <i>suddenly</i> increase when once developed.	When fluid portion is reduced it reveals a concealed testicle, which also reduces with gurgling and peculiar sensation of sickness.	Age.	Shape.	Podicle.	Inguinal canal.
				Usually in infants. Subsequent attacks may occur in adults.	Globular.	Marked.	Either distended or involved.
Hydrocoele.	Inguinal canal empty.	Always developed slowly and gradually.	Irreducible.	Any age. Not necessarily associated with previous attack.	Pyramiform.	None.	Empty.
Congenital Hernia.	May occur anywhere but here we consider only the scrotal variety.	When in scrotum, is formed <i>before</i> the tunica vaginalis closes after descent of testicle.	After reduction of fluid and intestinal portion the testicle appears. This is also reducible with gurgling and pain.	Age.	Fluctuation.	Translucency.	Translucent.
					Exists at upper part of tumour from presence of peritoneal fluid.	May be translucent.	
Infantile Hernia.	Scrotum.	Occurs <i>after</i> closure of tunica vaginalis.	Reduction of tumour leaves testicle <i>irreducible</i> .	Must common in infants, but <i>may</i> occur at any age.	Absent.	Always translucent.	Opaque.

No. 4.]	Location.	Advent and Development.	Percussion and Auscultation.	Pain.	Bowel.	Reduction.	Addenda.
Incomplete Inguinal Hernia.	Confined to limits of inguinal canal. Outlines often indistinct.	History of muscular strain usually present.	P. Frequently resonant. A. Gurgling.	Usually soft.	C. I. Often detected. F. Absent.	Generally <i>painless</i> .	Cedema absent. Constitutional symptoms absent unless sac be strangulated or inflamed.
Bubo.	Often diffused beyond the limits of the canal. Outline usually clearly defined.	Venereal origin often detected.	P. Dull. A. Negative.	Hard at onset.	C. I. Usually absent. F. Present if suppuration occurs.	Generally <i>painful</i> .	Cedema present. Frequent constitutional symptoms.
Bubonocoele.		May be sudden.	P. Frequently resonant. A. Gurgling.	Usually soft.	May be embarrassed.	Reduction with a gurgie.	Vomiting. Scrotum normal and both testicles present.
Undescended Testicle.			P. Dull or flat. A. Negative.	Hard like a gland.	Unaffected.	May be impossible. No gurgie.	Vomiting. Scrotum imperfect on side corresponding to tumour and testicle wanting.
Inguinal Hernia.	Felt only in inguinal region.	Developed <i>subdurally</i> after strain or injury.	P. Usually resonant.	Usually soft.	May be associated with <i>obstinate</i> constipation.	Pressure may effect reduction.	^{containing ascites unless} hernia be strangulated or inflamed. Not sensitive unless strangulated or inflamed.
Impacted Faeces.	Felt at the side as well as in inguinal region.	Developed <i>slowly</i> with colic pains and no <i>apparent</i> causation.	P. Flat.	Hard and nodulated.	<i>Always</i> associated with <i>obstinate</i> constipation.	Localized pressure causes induration.	Vomiting usually present. Always tender on pressure in advanced stages.
Inguinal Hernia.	Frequently scrotal and generally diffused.	<i>Sudden</i> and from above downward.	P. Resonant, as a rule. A. Gurgling.	Soft as a rule. Opaque.	Often embarrassed.	Reduces with a gurgie.	Movements of testicle have no effect. Reduction remains while recumbent position is maintained.
Hydrocoele of Cord.	Circumscribed in limits.	<i>Slow</i> unless produced by violence. Occurs from above downward.	P. Dull. A. Negative.	Tense. Often translucent.	C. I. Absent. F. Present.	Usually irreducible.	Movement of testicle transmits an impulse to the tumour. Return of reduction irrespective of position.
Enterocele.	In all forms of hernia.	Advent sudden, with <i>acute</i> pain.	P. Usually resonant.	Soft, compressible, elastic.	Never embarrassed.	Sudden return with gurgling.	
Ectoploce.	Rare in <i>Femoral</i> .	Advent <i>slowly</i> , with <i>dull</i> pain.	P. Flat.	Doughy, hard r. inelastic, and lobulated.	Unembarrassed unless we have Entero-epiplocele.	Reduced <i>slowly</i> in a lump with <i>no</i> gurgling.	

HERNIA.

CAUSATION, TREATMENT.

Please return this card, when filled, to

JOS. H. WARREN, A.M., M.D.,

51 Union Park, Boston, Mass., U.S.A.

The answers to questions in heavy-faced type may be given by drawing a line through superfluous words. Answers to those questions printed in light-faced type are to be written over the question.

Observer's name.

Residence, No. Street.

City or Town ; County or State.

Date.

No.

Name of patient. Age. Male, female. Single, married, widowed. Nationality. Occupation ; how long followed. Previous occupation, if any.

Previous illness. Enumerate in sequence.

Previous injuries.

Place of residence : high, low ; damp, dry ; exposed, confined. Food : insufficient ; meat, vegetable, or cereal diet predominates. Intemperate, total abstainer. Strong, moderate, weak. Dark, fair. Growth : rapid,

moderate, slow, retarded. Stature: tall, medium, short. Form: full, spare, obese, emaciated. General condition: good, fair, poor. Deformities: hereditary, congenital; acquired by habit, accident, or disease.

Respiration: deep, shallow; abdominal, thoracic. Menstrual history, if a female: irregular; dysmenorrhœa, amenorrhœa.

Nutritive system. Nervous system. Respiratory system. Osseous system. Muscular system. Circulatory system. Urinary system. Reproductive system.

Constitutional disease: syphilis, cancer, scrofula. Hereditary disease. Present state of health. Dress: corsets, belts, tight waistbands. Abdominal tumors: ascites, distended bladder, tympanites. Solid tumors. Fæces. Liver. Spleen. Cancer. Kidney. Cystic kidney. Floating kidney. Perityphlitic abscess. Retained testicle. Phantom tumor. Uterine. Ovarian. Parovarian. Hip disease. Spinal disease; carries, kyphosis, lordosis, scoliosis. Abscess of the hip. Anchylosis. Dislocation of femur: dorsal, sciatic, obturator, pubic. Talipes equinus, calcaneus, varus, valgus. Fevers: yellow, typhoid, scarlet. Diphtheria. Rheumatism. Gout. Elongated uvula. Pharyngitis. Abscess of pharynx. Whooping cough. Coryza. Laryngitis. Croup. Ulcer of larynx. Abscess. Œdema. Necrosis. Stricture. Polypus. Bronchitis: acute, chronic, capillary. Pneumonia. Abscess of lung. Gangrene. Active or passive congestion. Apoplexy. Œdema. Cirrhosis. Emphysema. Atelectasis. Phthisis. Pleurisy. Empyema. Pneumothorax. Hydrothorax. Mumps, metastatic to testicle. Œsophagitis. Stricture. Dysphagia. Gastritis. Dilatation of stomach. Chronic ulcer. Cancer. Stricture of cardia,

of pylorus. Dyspepsia. Gastralgia. Pyrosis. Duodenitis. Enteritis. Typhilitis. Dysentery. Diarrhoea. Cholera morbus, infantum. Ulceration of intestine. Obstruction of bowels from substances in bowels; from tumor, stricture, intussusception, twisting, strangulation. Colic: flatulent, bilious, lead. Perihepatitis. Hepatitis: acute, chronic. Abscess. Atrophy. Congestion. Cirrhosis. Fatty degeneration. Lardaceous degeneration. Cancer. Jaundice. Inflammation of hepatic ducts. Fistula. Obstruction. Cancer. Biliary calculi. Splenitis. Abscess. Enlargement due to malaria. Hypertrophy. Lardaceous spleen. Tubercle. Nephritis. Perinephritis. Pyelitis. Fatty degeneration. Amyloid degeneration. Hydronephrosis. Hypertrophy. Atrophy. Cancer. Calculus. Cystitis. Dilatation. Sacculation. Inversion. Extroversion. Stone. Paralysis. Spasm. Prostatitis: acute, chronic. Abscess. Hypertrophy. Atrophy. Cancer. Tubercle. Calculus. Stricture of urethra: organic, traumatic, spasmodic, inflammatory. Purpura. Scurvy. Plethora. Anæmia. Leucocythemia. Pyæmia. Chlorosis. Retention of urine due to inflammation caused by gonorrhoea, drink, or exposure to cold; by organic stricture; by congestion of the prostate; by atony of bladder due to over distension, to paralysis, impacted calculus. Hysterical retention. Gravid or displaced uterus. Phimosis. Balanitis. Gonorrhoea. Paraphimosis. Sores: syphilitic or non-syphilitic. Scrotum. Extravasation. Œdema. Elephantiasis. Epithelioma. Testicle. Acute orchitis. Sarcocoele. Syphilis. Tubercle. Chronic inflammation. Hernia of testis. Hydro-sarcocoele. Malignant tumor. Adherent nymphae. Noma. Vascular urethra. Labial hæmatocele. Labial cyst. Labial abscess. Venereal sores. Mucus tubercles. Warts. Epithelioma. Elephantiasis.

asis. Hemorrhoids: external, internal. Prolapsus ani. Polypus. Ischio rectal abscess. Fistula in ano. Stricture. Fissure. Schirrus. Tumor of testicle involving skin spermatic veins tunica vaginalis testicle epididymis or cord. Extending up to the external abdominal ring. Impulse on coughing. Reducible into abdomen. Non-translucent. Weight. Consistence.

RECORD OF CASE.

Duration. Congenital. Acquired. Assigned cause. Probable cause. Form of Hernia: original, right, left, direct, oblique, complete, incomplete, scrotal, labial. Femoral, right, left. Umbilical. Ventral. Irreducible, incarcerated, strangulated. Local symptoms and signs: pain, tenderness, fluctuation, pulsation, translucency, cough impulse, consistency, definitions, mobility. Size in definite figures. Constitutional symptoms. General debility: nausea, vomiting, diarrhoea, constipation. Hernia retained: simple bandage, elastic belt, spring truss. Give name of truss worn. Hernia cannot be retained.

TREATMENT AND PROGRESS OF CASE.

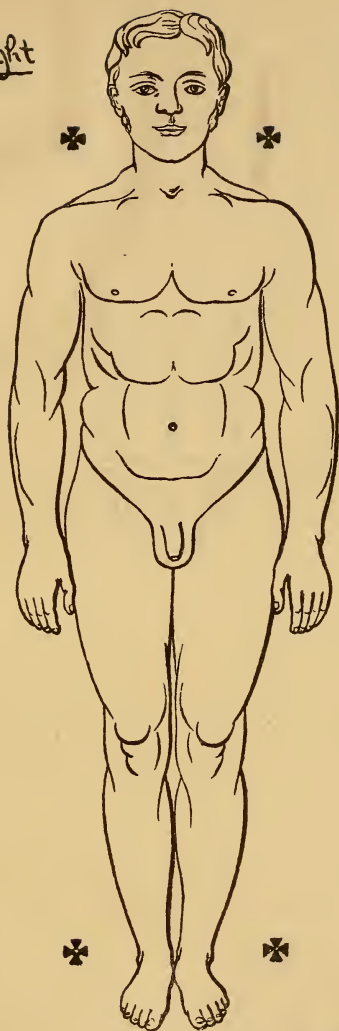
In as brief a manner as possible describe the method and instrument used,—by name, if in common use; by detail, if not commonly known,—giving any modifications that may be adopted, and instrument used if

injection is made. Mention the steps of the operation and dressings applied. Afterwards record each day: the pulse, temperature, and respiration; the treatment and diet; the condition of the parts in question; the amount of swelling and inflammation; the amount and character of discharge; the period of granulation and the time of removal of sutures or ligatures; the formation of abscess; the date of discharge and of cure.

REMARKS.

Right

Left



Left

Right



Right.

Left.



1	2	3
4	5 X	6
7	8	9
O		O
F		F



C. S. 2V.

Figures refer to regions; letters, to herniæ. O, Inguinal hernia; F, Femoral hernia; X, Umbilical hernia; 1, 3, Hypochondriac region; 2, Epigastric; 4, 6, Lumbar region; 5, Umbilical; 7, 9, Inguinal region; 8, Hypogastric.

OPERATION BY SUBCUTANEOUS INJECTION.

NUMBER OF CASE.	INGUINAL.	DIRECT.	OBLIQUE.	RIGHT SIDE.	LEFT SIDE.	FEMORAL.	RIGHT.	LEFT.	UMBILICAL.	DURATION.	CONGENITAL.	ACQUIRED.	SINGLE.	DOUBLE.	MALE.	FEMALE.	AGE.	DATE.	FORMULA USED, A, B, C.	TRUSS AND ALL SUPPORT DISPENSED WITH.	OCCUPATION.	CURED.	RELIEVED.	DATE.	REMARKS.
E. CIII.	-	-	-	-	-	Femoral.	Right.	-	Umbilical.	8 years.	-	Acquired.	Single.	-	-	Female.	55	Feb., 1880.	B.	None worn for 2 years . . .	Housewife	Cured	-	May, 1883.	This was a small rupture, but very painful; often became strangulated.
T. CIV.	-	-	-	-	-	-	-	-	-	20 "	-	"	-	-	-	"	52	" 1880.	C.	" for 3 " . . .	"	"	-	" 1883.	This was a very large rupture, caused by child-bearing; became strangulated three times.
D. CV.	Inguinal.	-	Oblique.	Right side.	-	-	-	-	-	3 "	-	"	-	-	Male.	-	26	" 1880.	"	" for 2 " . . .	President of Manufacturing Company.	"	-	" 1883.	This was a medium-sized rupture, caused by lifting; became strangulated once.
H. CVI.	"	"	"	"	Left side.	-	-	-	-	10 "	-	"	-	-	-	-	32	March, 1880.	"	" for 1 year . . .	"	"	-	" 1883.	This was a very large rupture, caused by long illness and dyspepsia.
Dr. H. CVII.	"	-	"	"	-	-	-	-	-	25 "	-	"	-	-	-	-	52	" 1880.	"	" for 2½ years . . .	Physician	"	-	" 1883.	This was a small rupture, caused by running and leaping.
L. CVIII.	"	Direct.	-	-	"	-	-	-	-	1 year.	-	"	-	-	-	-	40	April, 1880.	"	" for 2 " . . .	Civil Engineer	"	-	" 1883.	This was a very large rupture on left side, small on right. does not know cause.
W. CIX.	"	-	"	"	-	-	-	-	-	2 years.	-	"	-	Double.	-	-	24	" 1880.	"	" for 2½ " . . .	Teacher	"	-	" 1883.	This was a small rupture, caused by a fall.
W. CX.	"	-	"	"	"	-	-	-	-	5 "	-	"	-	-	-	-	31	May, 1880.	"	" for 1½ " . . .	Architect	"	-	" 1883.	This was a large rupture, caused by illness and great emaciation.
S. CXI.	"	-	"	-	"	-	-	-	-	1 year.	-	"	-	-	-	-	22	" 1880.	"	" for 1 year . . .	Student	"	-	" 1883.	This was a large rupture on right side, small on left. do not know cause.
B. CXII.	"	"	-	"	"	-	-	-	-	40 years.	-	"	-	-	-	-	64	" 1880.	B, C.	" for 2 years . . .	Agent of railroad	"	-	" 1883.	This was not a very large rupture, caused by lifting.
C. CXIII.	"	-	"	"	"	-	-	-	-	5 or 6 "	-	"	-	-	-	-	43	June, 1880.	C.	" for 1½ " . . .	Farmer	"	-	" 1883.	These were a large and a small rupture; do not know cause.
D. CXIV.	"	"	"	"	"	-	-	-	-	1 year.	-	"	-	-	-	-	25	Sept., 1880.	"	" for 1 year . . .	Clerk	"	-	" 1883.	This was a large rupture, caused by over-straining.
E. CXV.	"	-	"	"	-	-	-	-	-	7 years.	-	"	-	-	-	-	35	" 1880.	"	" for 1½ years . . .	Painter	"	-	" 1883.	This was a medium-sized rupture; do not know the cause.
F. CXVI.	"	"	-	"	-	-	-	-	-	4 "	-	"	-	-	-	-	44	" 1880.	"	" for 1 year . . .	Clergyman	"	-	" 1883.	This was a large rupture on left side, small on right, do not know the cause.
Dr. D. CXVII.	"	-	"	"	"	-	-	-	-	35 "	-	"	-	-	-	-	38	Nov., 1880.	"	" for 1 " . . .	Physician	"	-	" 1883.	This was a large rupture, caused by stepping down from sidewalk.
G. CXVIII.	"	-	"	-	"	-	-	-	-	5 "	-	"	-	-	-	-	54	Dec., 1880.	"	" for 1 " . . .	Retired merchant	"	-	" 1883.	This was a small rupture on left side, large on right side, caused by railroad accident.
W. CXIX.	"	-	"	"	-	-	-	-	-	2 "	-	"	-	-	-	-	28	Jan., 1881.	"	" for 1½ years . . .	Lawyer	"	-	" 1883.	This was a medium-sized rupture, caused by horse-railroad accident.
Dr. W. CXX.	"	-	"	"	-	-	-	-	-	8 "	-	"	-	-	-	-	37	" 1881.	"	-	Physician	"	-	" 1883.	This was a very small rupture.
L. CXXI.	"	-	"	-	"	-	-	-	-	1 year.	-	"	-	-	-	-	5	" 1881.	"	" for 1 year . . .	Child	"	-	" 1883.	This was a small rupture, but very painful.
W. CXXII.	"	"	-	"	-	-	-	-	-	8 mo'ths.	-	"	-	-	-	-	27	March, 1881.	"	" for 1 " . . .	Student	"	-	No report.	This was a small rupture.
P. CXXIII.	-	-	-	-	-	-	-	-	-	3 years.	-	"	-	-	-	-	31	" 1881.	"	" for 1½ years . . .	Bank-clerk	"	-	May, 1883.	This was a rupture not larger than an English walnut.
B. CXXIV.	"	"	-	"	-	"	"	-	-	2 "	-	"	-	-	-	-	33	April, 1881.	"	" for 1 year . . .	Farmer	"	-	" 1883.	This was a small rupture.
J. CXXV.	"	-	-	"	-	-	-	-	-	1½ "	-	"	-	-	-	-	46	" 1881.	"	" for 1 " . . .	Sea-captain	"	-	" 1883.	This was a medium-sized rupture.
G. CXXVI.	"	"	-	"	"	-	-	-	-	9 mo'ths.	-	"	-	-	-	-	44	" 1881.	"	Wears truss, but no need of it.	Seaman	"	-	" 1883.	This was a medium sized rupture.
H. CXXVII.	"	-	"	"	-	-	-	-	-	6 years.	-	"	-	-	-	-	60	June, 1881.	"	None worn for 1 year . . .	Gentleman	"	-	" 1883.	This was a very large rupture.
Dr. CXXVIII.	"	-	"	-	"	-	-	-	-	1 mo'th.	-	"	-	-	-	-	21	" 1881.	"	" for 1½ years . . .	Carpenter	"	-	" 1883.	This was a small rupture.
F. CXXIX.	"	"	-	"	-	-	-	-	-	7 years.	-	-	-	-	-	-	45	July, 1881.	"	" for 6 months . . .	Peddler	"	-	" 1883.	This was a large rupture.
V. CXXX.	"	"	-	-	"	-	-	-	-	18 "	-	-	-	-	-	-	35	" 1881.	"	-	Laborer	"	-	" 1883.	

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